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THE IRON TRADE REVIEW.

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CLEVELAND, O., SEPTEMBER 5, 1889.

THE WEEK IN IRON CIRCLES.

General Features. We can give no better idea of the situation than by quoting from Mr. James M. Swank, General Manager of the American Iron and Steel Association, undoubtedly the best informed authority in the country as to the ins and outs of the iron trade. Mr. Swank says: "The condition of the American iron market at the present time is characterized by great firmness in prices and by general activity in the consumption of all leading iron and steel products. The past two weeks have witnessed a further advance in the prices of pig iron at Pittsburgh. Since the 1st of June, when prices had reached their lowest ebb in the depressed condition of the trade which prevailed during the first five months of the year, the price of Bessemer pig iron at Pittsburgh has advanced from $15.75 to $17.75 and $18 per ton, and gray forge pig iron, made from lake ore, from $13.85 to $15 and $15.25. Bar iron and rails have also advanced, in sympathy with the raw material. A month ago best bar iron was selling at Pittsburgh at 1 6-10 cents per pound; it is now quoted at 1¾ cents. Steel rails have advanced at Pittsburgh since June from $26 to $28 per ton. The present enhanced prices, however, in each case, except for Bessemer pig iron, are below the average prices of 1888, and as wages have been advanced, and the price of fuel is to be raised, there is very little, if any, increased profit for the manufacturer." The foreign iron trade still holds up. The wave of advancing prices is moving both Westward and Southward. At Buffalo the iron market, in all branches, continues to present hopeful features. Since July 1st. there has been a slowly hardening tendency, the net result to date being an advance of about $1.00 per ton in pig iron and $2.00 per ton in manufactured forms. Production is very heavy, occupying almost the full capacity of the country, but consumptiom is at quite an equal pace, and stocks are declining. The demand seems to be legitimate, healthful and growing in all the region tributary to Buffalo. Since the last report from Pittsburg, pig iron has climbed another notch and is strong at the advance. It would not, however, be surprising should a lull occur for a time, as sales have been remarkably large, and money consumers have supplied their wants for some time to come. The month opens at Detroit showing advances of about $1 per ton on nearly all grades of iron. Mill irons, both of Southern and Northern make, and, perhaps, the scarcest grades on the list, possibly excepting Lake Superior charcoal iron, which is in large demand, with a notably short supply. Rumors that charcoal iron was still weak were plentiful, and that prices were being cut, but our correspondents, Wm. F. Jarvis & Co., are unable to find any confirmation of this, for not only is the supply short, but large sellers are asking $1 per ton over the lowest prices of this year. This would seem to indicate that the output of the Lake Superior region for this grade of pig iron would be taxed to its utmost. There is, perhaps, a little more activity this week than last in the Lake Superior market, although hardly enough greater to be marked. The volume of business is good, so evenly distributed that it does not attract the attention, though, it would if the transactions were bunched into fewer and larger. The current needs of the consumers seem to take the product of the furnaces at the same rate as the output. Stocks of coke iron in the South particularly are very low and in condition to feel quickly any decided increase in demand. Charcoal foundry irons have not shared to the same extent as coke irons in the improvement. The prospective advance in freight rates north of the Ohio River has been a disturbing element in the market, which is soon now to be settled by the announcement of what the advance will be. The firmness of prices will necessitate an increase of the delivered price to the extent of this freight advance. In the South, taking Louisville as the center, the outlook is improving. While the sales the past week have been greater in number, they have been confined to small quantities, with an occasional round order for deliveries extending far into the future. There has been no quotable change in the situation, so far as prices are concerned, which are held firm, with the exception, perhaps, in the case of some new Southern coke furnaces, which, though not yet in blast, are said to be selling at low figures for future delivery. Pig iron at Chicago is still running in the same rut of firm prices and quiet trade. The business doing is evenly divided among all grades of iron, and is chiefly to supply the current requirements, there being very few contracts offered for scattered forward deliveries. Foundries and mills in the vicinity of Chicago are, as a rule, busy and consuming heavily, but out of the market at present. The market remains steady and quiet. There are no inquiries for large lots, but numerous small orders are being filled. Foundries are buying iron to supply current wants only, and seem not to fear any heavy advance in prices. Genuine Connellsville foundry coke is 50 cents higher at St. Louis, since the strike.

Iron Ore. The most important thing to effect the market at this late day is the advance in freights which, although expected during the middle of August, came none the less sudden. The first announcement of $1.20 charter from Marquette was so obviously a special charter that it was not anywhere accepted as a bona fide advance. The vessel chartered at that rate was to bring down a load of ore that had been in a pocket for a long time and for which there was neither a shipping order nor dock room on arrival. Taking, therefore, into consideration the delay incident to such a cargo, the special rate paid was deemed neither exorbitant nor the basis for other charters at that figure. On Wednesday, of this week, however, $1.20 was freely paid from Marquette and $1.05 from Escanaba, with Ashland to hear from. The reason for the advance is found in the continued shipments of ore, with a lively demand for vessels by the grain trade. There is little ore of any sort offered for sale except some manganetic ore, of which a block may be had at $4.25.

Pig Iron. The market is characterized by an active buying movement which has all the indications of having come to to stay. The sales, both for legitimate and speculative purposes, are very large, Bessemers and mill irons having the call. The consumption of pig metal during the past month has been enormously large and there is an appreciable reduction in the stocks reported by the Western Pig Iron Association. There is no scarcity of coke in the local furnace market, despite the reports to that effect. Makers of iron are curious to witness the establishment of a $4,000,000 furnace and mill plant for the manufacture of "steel nails from the ore without any intermediate process," as announced by a daily newspaper.

Merchant Iron. Bar iron is firm and sales are quite large, owing to increased activity on the part of car-works. Sheets command their own price, being quoted in Cleveland at $3 for No. 26. The mills refuse to take orders fer delivery inside of six weeks.

Scrap Iron. The tendency of the market is illustrated by another advance in the price of old American rails to $25. Wrought scrap is also quite high and promise to be higher yet.

Hardware. There is a large demand for building contractors' and manufacturers' supplies and in a local way the business is strong. Metals are not as firm as they might be. The general Fall trade has not yet begun.

"THE SURVIVAL OF THE FITTEST."

In commenting on the winding up of the affairs of the Norway Iron and Steel Company, of Boston, on account of its inability to compete with Western iron companies, Mr E. C. Pechin, the widely known metallurgical expert, in THE IRON TRADE REVIEW (issue of October 25, 1888) said:

We are sorry for the Norway Iron Company, and for those other mills and furnaces that, before long, must follow their example. Vast stores of iron and fuel, that were unknown or inaccesible when the Norway works were started, are now, through the unexampled development of the country, in the midst of, or alongside of flourishing, laboring, consuming and producing communities, who necessarily wage a friendly but deadly commercial warfare upon less favored sections. The competition that comes by reason of free trading in the United States is reducing, and necessarily must gradually reduce, the price of all manufactured articles, and those who can make the cheapest will stay, the rest must go. The Treasurer [of the Norway works] says that if the duty could be taken off his *raw material*—pig iron—they could continue to run, despite Western competition. While we are sorry that 500 men should be thrown out of employment by the closing of these works, we are glad that the thousands and tens of thousands of hardy men, who dig the ores and coal, and turn the coal into coke, and transport the same by rail and vessels, and make it into Mr. Geiger's *raw material*, have the chance of doing all this work in this country, rather than England should have the opportunity of supplying us. It is a fundamental rule that the many must be protected, even if a few suffer, and the makers of over 6,000,000 tons of pig iron must be looked after, rather than a few hundreds or thousands who work it up. As far as the people are concerned, the shutting up of one, or even many, establishments makes no difference. The low cost of transportation enables the finished makes of works far away to be sent everywhere. Generally, prosperous conditions obtain, and the men who are now discharged will have no difficulty in earning a livelihood elsewhere in this favored country. The capital invested will necessarily suffer in the closing up, but this is one of the contingencies of business life, and the wise meet promptly what must come sooner or later.

These words possess peculiar appropriateness at the present time in view of the movement of some New England manufacturers to secure a modification of the tariff in their especial interest; and they are emphasized and enforced by the following extracts from a letter addressed the Boston *Herald*, by Mr. George M. Rice, President of the Worcester (Mass.) Steel Works, who would be interested, if any one, in the proposition to admit his "raw material" free of duty. Says Mr. Rice:

One of the needs of New England is protection of the iron and steel interests by a tariff about as at present. There is in Rhode Island, and perhaps in Massachusetts, a very large supply of the best coal for smelting iron ore mined in this country, or any other country. There is also a mountain of iron ore, apparently inexhaustible, of the very best material for making steel. During the war of 1812 it was used for making cannon, and they proved of great strength. A few months will be likely to demonstrate the facts in this statement. Pig iron can be made at Portsmouth, R. I, cheaper than it can be made in Pennsylvania or in any part of the country except Alabama and Tennessee. The pig iron made in those States is not suitable for making the best steel, being so high in phosphorus and sulphur, while that of Rhode Island is very low in phosphorus and sulphur. The Rhode Island coal has some fluxing properties, increasing its value. If the people in New England had devoted a portion of their enterprise to develop the iron and coal instead of doing so much in cotton and wool, a very different view would have been taken by parties who are interested in its prosperity. We are using this coal under our boilers for making steam, and in our cupola, with a great saving in cost and quite to our satisfaction. The work of our most famous geologists, Professors Jackson, Silliman and others, will fully confirm all I say about coal and iron. Theirs was theory, ours is practice positive.

Mr. Rice writes like a patriot, and we have do doubt he is one, in the truest sense of the word. As THE IRON TRADE REVIEW has before observed on this subject: "If, instead of petitioning Congress to do a very unjust thing toward a great industry and its allied branches, New England manufacturers would turn their attention to new locations, new processes, or new lines of manufacture, there would be no occasion for misleading petitions."

NO LONGER ENGLISH, BUT AMERICAN CAPITAL.

Still the acquirement of large American plants goes merrily on. Not to speak of the breweries, and land companies and Western mortgages recently absorbed, the important news of the day is the proposition of an English syndicate (presumably the same one which purchased the Otis Iron and Steel Works, of Cleveland) to buy the extensive works of the Thomas Iron Company, at Hokendauqua, Pa. Proxies are now being taken among the stockholders for a vote, September 10, upon the question of sale, and it is announced that this, if effected, means a sort of iron and steel trust—though wherein the ownership of two concerns can be made to constitute a trust, does not at first appear.

These movements again press to the front the question, Is there any danger to our protective system in the absorption of American concerns by foreign capitalists? The New York *Press* has thought the question of sufficient moment to address letters of inquiry to leading Americans, and the replies, many and varied, are extremely interesting. While many see in the present movement a menace to American interests, unless carefully guarded by appropriate legislation, the general concensus of opinion, summed up in the two samples given below, seems to be that the more foreign capital we draw in, the better. With a broad, and as yet imperfectly developed, field for investment, with the increase of capital, and the consequent lowering of the interest rates, the results, it is argued, will be beneficial rather than harmful. As a member of the well-known firm of Marshall Field & Company, of Chicago, puts it: "These English investments have already brought over some of the best of British subjects to America. Where the treasure is the heart is also. When they do come to live with us, the investments cease to be English and are positively American." Answering the objection, that, while the investments remain here, the profits go out of the country, A. Shuman, head of one of the leading Boston houses, says: "Well, but isn't the country just so much richer and isn't the market expanded because of the stimulating influence of this outside capital? What if the profits do go abroad, doesn't the capital remain here? It has to and we may well allow the exportation of $300,000 in the shape of profits on a working capital of $6,000,000. Doesn't that leave America ahead just $5,700,000 on this little financial transaction? * * * Let our friends on the other side bring over all the money they want; then, when it begins to look as if they meant to gouge us, let us legislate a little, and show them the power of a popular government by pinching their toes in the trap they set themselves."

Upon the same point, the Anniston (Ala.) *Hot Blast* says: "The probabilities are, of course, that the earnings of these properties will go abroad rather than remain at home. The probable consequence of such purchases is, that they will lead to the coming here of a great many people who profit by such purchases. In itself, there is no particular harm to be anticipated from this tendency. It matters very little where the person lives who make the dividends, but of course it would be better to have them here to spend their moieties than abroad. Things like this regulate themselves. One thing about these Englishmen is, that they pay big prices for what they buy, and pay spot cash. They do not ask credit, don't jew us down, and treat us liberally and honorably."

Yes, we can stand any amount of influx of foreign capital, but it should be distinctly understood from the start, that, once invested in America, it becomes American capital, bound to respect American interests, and pay the American scale of wages.

FOR CHICAGO—YES.

We are asked by the Chicago Press Committee to put in a good word for that city as the site of the World's Exposition of 1892, and we cheerfully comply.

Chicago is a great metropolis.

She possesses more railroads, houses more anarchists, rears higher structures, carries on more speculation, commands wider markets, turns out more sensations, raises saucier journalists, produces more pork and less poetry, boasts more rapid street cars, takes in more adjacent prairie land, and has more get-up-and-get than any other American city.

If the idea is to give our foreign visitors a view of American progress and public spirit, unhampered by European conventionalities, free as the festive cyclone and boundless as the billowy prairies, drop them down in Chicago.

What is the statue of Liberty Enlightening the World compared with the magnificent and crumbling county buildings?

What is the insignificant Hudson compared with the noble Chicago river, of which the poet sings—

There is something endearing about it,
And something enchanting as well—
They may sneer, they may snicker, and scout it—
We're wrapt in its magical spell.
Though others may question and doubt it,
Though some may compare it to—well,
We'd be lonesome if we were without it,
Our river's remarkable smell,
Smell,
Smell,
Our beautiful river's loud smell.

Chicago beats the world for energy, enterprise and push. But she is too modest—and modesty doesn't win in these days.

TRY AGAIN, PITTSBURGH.

In THE IRON TRADE REVIEW of August 22 we stated, on the authority of the Pittsburgh *Dispatch*, that, as the result of a

comparative test of wrought and cast iron pipe, at Columbus, the former came out victorious, the bulk of the $500,000 order going to the American Tube and Iron Company, a Pittsburgh concern. Last week we printed the statement of Mr. Dwight Kinney, Secretary and Treasurer of the Addyston Pipe and Steel Company, of Cincinnati, that fully twenty-five miles of this order went to Northern cast iron foundries, and now we have the statement of Mr. J. O. Johnston, Superintendent of the Central Ohio Natural Gas and Fuel Company, to this paper, putting an entirely different phase upon the Pittsburgh story, as follows:

Yours of the 26th at hand. Our contract for pipe calls for 233,045 feet of cast pipe, to be supplied by the Addyston Pipe and Steel Company, the Shickle, Harrison and Howard Iron Company and the Ohio Pipe Company; also 164,040 feet of wrought pipe, the order for which is divided between the Chester Pipe and Tube Company and the American Tube and Iron Company.

It will thus be seen that, of the 75.2 miles of pipe contracted for, 44.1 miles, or 60 per cent., went to cast-iron foundries, and the remainder, 31.1 miles, or 40 per cent., went to two wrought pipe concerns, instead of to one. It is difficult, therefore, to see from the above wherein the Pittsburgh *Dispatch* has any particular cause for glorying.

OIL CITY is in danger of losing one of her chief industries, unless the councils of that town back down from their present position. It seems that in 1886 the Oil City Tube Works was induced to locate its works in the city by an agreement with the councils that the company should be exempted from city taxes for ten years and that the water commissioners should furnish the water required by the works for the same period at the rate of $1 per year. Last year the contract was repudiated, and the company compelled to pay over $700 into the city treasury. This year the assessment is at an increased valuation. Other towns have offered excellent inducements to have the tube works move, which they will probably do if the city authorities refuse to live up to their contract.—[American Manufacturer.

Upon this statement of the case, the city authorities of Oil City appear in the bad light of contract-breakers; but what can be said of the wisdom of ever making a bargain so manifestly unfair to every other establishment in the place? It is but another illustration of the evil of bonusing, of which communities cannot too often be warned.

THE Welsh makers have strong allies in the United States, and, if the alliance is made the most of, we should have very considerable doubts of the success of any application to Congress to increase the present duties. But to insure that result the Welsh makers and their business connections must not only watch but work, and work hard, to checkmate the advances of the American ultra-Protectionists.—[London Ironmonger.

This, then, is the dictum of the Welsh tinplate makers. How do American manufacturers and workingmen like it?

EAST-BOUND freights from Pittsburgh and Cleveland have been advanced, but not to the figures prevailing for some time past. An advance in west-bound freights is also pending.

THEORY OF STEAM.

BY PROF. J. F. ELSOM.

If one takes a beaker full of water and mounts it on a tripod above a flame and suspends a thermometer in it, it will be observed that the water gradually gets hot. Suppose we begin with water at the melting point of ice, that is to say, 0 degrees C., its temperature, as evidenced by the thermometer, will gradually ascend until the boiling point of water, viz., 100° C. = 212° Fahr. When this point is reached the temperature will refuse to go higher, and to all intents and purposes, the water refuses to receive any additional heat. Notwithstanding this, the heat keeps pouring from the flame as before, and still the water receives none of it, at least it gets no hotter. At last, however, a point is reached when the water suddenly springs into steam; then, and not till then, the temperature will again begin to ascend and arise from degree to degree as the flame below warms it. But what became of the heat from the flame, from the time the water reached the boiling point until these gases began to escape, is really of more importance to steam users and steam buyers than what becomes of the treasury surplus of this nation.

When heat has raised a quantity of water from nothing to the 100°, it then ceases to make itself evident in the ordinary way of affecting temperature, and takes effect by doing the work of separating the particles of the water and bringing them into the condition they are in the form of steam, an invisible gas, until cooled off by the surrounding atmosphere. The steam once produced, as it can be brought into no more attenuated condition by work in the form of heat, is immediately affected thermometrically by heat and then gets hotter and hotter, as thermal increments are applied to it, the heat which, when it enters the water, makes it no hotter, but affects it by doing work on its particles, is recognized by engineers as latent heat; the ordinary variety of heat (not that there are more than one kind of heat existent in any objective way, the effects only of the one thing being of two kinds), namely, that which when entering into the water causes it to get hotter, in proportion as it is applied, and is denominated by engineers, sensible heat.

The great point, then, wherein the modern steam engine, even of the very best type and most skillful manufacture, falls very short of a perfect machine, utilizing more than the merest fraction of the merits of heat represented in the fuel consumed, is, that the whole of the heat of the steam used in it is thrown away and lost, and notwithstanding the fact that heat must be constantly applied at one point of the engine, namely, where steam is generated, yet, at the same time, heat is being continually gotten rid of and thrown away at another point, namely, at the exhaust pipes.

When steam, say of sixty pounds pressure, is generated in a boiler, the water it is produced from is first raised to 100° at a great expenditure of fuel, and then an enormously greater amount of heat is required to be passed into it before it can be made to assume the gaseous condition. On acting in the cylinder the steam loses its energy and falls from sixty pounds pressure to that of the atmosphere, and then is thrown away, with all its heat, into the air, or, at last, has its sensible heat retained by condensation, while the whole of its latent heat is thrown away with every stroke of the circulating pump.

To bring it down to the understanding of all, we call a thermal unit the quantity of heat necessary to raise one pound of water through one degree centigrade. It is found that one pound of steam at one hundred degrees in condensing to water at the same temperature, gives up four hundred and fifty thermal units. In other words, one pound of steam at 100° contains as much heat in the latent condition as is sufficient to raise 540 pounds of water through one degree, or what amounts to the same thing, 5.4 pounds through 100 degrees, then we require nearly five and one half times as much heat to convert one pound of water at 100° into steam at the same temperature, as is needed to raise the same weight of water from 0 degrees to the boiling point.

Some time ago, I stated in an address delivered to a society of steam engineers, that "it is apt to be taken, a *priori*, as an impossibility to recover or utilize the heat of exhaust steam, or in any way to plan an engine in which all the heat or potential energy of the steam shall find its way back, in one form or another, to the boiler. However, there are thinkers and experimenters of authority who hold there to be no inherent impossibility in the matter, and, in all probability, a time will come when a solution of the problem will be lighted on by some one. It only needs to be said that a fame and a fortune, second to none that the century has brought forth, awaits the happy inventor when he does appear.

"Various attempts have been made from time to time to solve the problem under notice. The principle of the injector seems on the first view of it, to be one by which the steam in a boiler can be made, by its own energy, to force in vapor against its own pressure. However, the real rationale of the injector's action is that of merely condensing a portion of the steam in a boiler, and throwing in feed-water to take its place. To inject feed-water at a higher temperature than is consistent with its condensing the steam it is brought in contact with, is an impossibility, unless extraneous forces are made use of, in which case as much work will inevitably be destroyed as it is sought there should be recovered.

"There are various salts and bases—or rather bases alone, we may say, as they all combine with water, and the mere solution of a salt leads to a cooling effect instead of the giving out of heat—which combine with water and produce a liquid having a temperature much higher than the boiling point of water; and with these, many experiments have been made from time to time, with a view to obtaining available heat from the condensation of steam. For instance, some time ago a patent was taken out by a French engineer, if we are not mistaken as to the nationality, for condensing steam by means of lime, and producing thereby a temperature of about 150° to 200° C. But, as was to be expected beforehand, his project broke down, at any rate as a commercial success, on this point. The lime absorbed the steam and produced a high temperature until it was saturated. But the moment this point is reached the steam passed through it unaffected; and as for driving off water from the hydrate of lime formed and reducing it again to the dry condition, this would be sacrificing just as much heat as had been originally economized by the contrivance." As yet I have seen no reason for a change of opinion.

Commenting on this little talk of mine, some of the Philadelphia trade journals attempted to show that some of these units were reconverted into other gases, hence were not destroyed; but the talk they indulged in, and the long-legged words—I do not know where they found them—I will confess are too weighty for a pigmy Hoosier, and altogether too rich for my British blood. Frankly, I do not believe in high-sounding platitudes, and venture the assertion many of the so-called technical writers cannot define half the words they use, and many others cannot work out half their tabulated statistics by a simple algebraic theorem. That arbitrary Cleveland chief of mine will not let me have the space—even if I wanted it—for going into, or even alluding to, the various attempts, some of them wild enough in their way, that have been made to deal with this complex problem I am speaking of; any attempt at such an enumeration would occupy all the reading space of this number, and what would it amount to?

It is argued by some that the steam engine has been brought to such a state of perfection, and has already attained to such a *ne plus ultra* condition, that very little more is possible to be done to it by anyone. But so far is this from being the hard, cold fact that, were the problem I hinted at but solved, it is not a visionist's wild vagary to say it will be some day, a steam engine would then be possible which would be to the present engine what Watt's engine was to Hero's Eolipile. Am I not correct?

I wish some of your readers would find fault with what I say, and have a discussion. What is the reason some one does not? It can't be they agree with every one, or perhaps no one reads them.

WE are assured that it is the experience of Southern iron manufacturers that the negro is entirely available for performing all classes of work in rolling mills as well as foundries. A rolling mill or a foundry can be run with negro labor on 60 per cent. of what it would cost to do the same work with white labor.—[Iron Age.

STRAIGHTENING METAL PLATES.

IRONMONGERY (LONDON).

To bring a plate of metal to an even and true surface is an operation which the workman, who executes ironmongery repairs, is frequently called upon to perform. In stoves and grates, the unequal heating to which their sheet iron portions are necessarily exposed, is a common cause of "cockles," or protuberances occurring in them; the same is true with respect to the sides and bottoms of tin and copper utensils; while such articles as circular steel saws become buckled or slightly bent through being cooled with water when heated in working. To strengthen a metal plate, whether thick or thin, is by no means so easy a task as might be thought at first sight. The mode of operation that would naturally suggest itself to the uninitiated, is precisely that which is least likely to be attended with success. This is an undoubted fact, and is incidentally illustrated by Mr. Herbert Spencer, in his "Study of Sociology," where occurs the following passage, which cannot be without interest to the practical mechanic: "You see this wrought iron plate is not quite flat, it sticks up a little here towards the left—'cockles,' as we say. How shall we flatten it? Obviously you reply, by hitting down on the part that is prominent. Well, here is a hammer, and I give the plate a blow as you advise. Harder, you say. Still no effect. Another stroke? Well, there is one, and another, and another. The prominence remains, you see; the evil is as great as ever—greater, indeed. But this is not all. Look at the warp which the plate has got near the opposite edge. Where it was flat before it is now curved. A pretty bungle we have made of it. Instead of curing the original defect, we have produced a second. Had we asked an artist practiced in 'planishing,' as it is called, he would have told us that no good was to be done, but only mischief, by hitting down on the projecting part. He would have taught us how to give variously-directed and specially adjusted blows with a hammer elsewhere—so attacking the evil, not by direct, but by indirect, action."

It is not always easy, however, to obtain the requisite instruction in these matters from an experienced workman; not that he is usually unwilling to impart information, but rather because he finds himself unable to put it into words. Long experience has taught him how to remove all kinds of irregularities from metal plates, and he knows almost instinctively how to use his hammer. But if we watch him at work, we shall at first be unable to understand why he treats one kind of "cockle" differently from another, or why he directs the blows of his hammer differently in different cases. To him, every bent piece of metal is a separate case demanding separate treatment, and he is seldom conscious of the principles upon which he works. Like the conjuror, he can show us "how it is done," and we remain as wise as we were before.

Now, although it is undoubtedly true that the art of straightening metal plates can only be properly acquired by practical experience, yet there are principles which, if previously acquired by the workmen, will tend to considerably shorten his labors. We will endeavor to make these principles understood, but before proceeding to do so, it will be well to give some explanation of the mechanical conditions involved in the cockling or buckling of metal plates, and how the presence of such defects can most readily be detected when they are so slight as to escape casual observation, so that the causes which tend to produce them may be checked at the outset.

Obviously, if a metal plate is perfectly flat and smooth, every part of it must be equally stretched in every direction of a plane. But a cockle or dent is like a bag or pocket in the metal, which is stretched less than the parts adjacent. In other words, the cockled part is what is called a "loose place" in the metal, the adjacent parts being proportionately "tight" or "short." In some cases there may be a tight place in the middle of a plate, and then the surrounding parts are comparatively loose, which causes a cockling of the edges. The evenness of the surface may be tested, for ordinary purposes, by applying a straight edge to it, and turning it about so as to test the plane in every direction.

A more accurate method for determining slight irregularities is to set the plate edgewise and sight it with the eye, watching the effect of light upon its surface. Slight depressions or protuberances cast slight shadows, such as result from dips and mounds on the surface of the earth. If the plate is thin enough to be bent into slightly curved forms with the hands, as is the case with thin sheet iron, or to be "sprung" like a saw-blade, then irregularities, or the loose and tight metal which tend to produce them, can be detected very easily. The presence of a loose place is detected in a saw-blade by grasping it with both hands at an interval of about nine inches apart, and bending it backwards and forwards. If it bends more readily one way than another this indicates the presence of a loose place somewhere. The practiced eye will watch the play of light upon the metal, and will see which part moves most. The part that moves most is loose. If the end of the blade or plate is rested upon a bench or anvil, and the other end supported with the hand, while the other hand is used in pressing down the middle of the plate and letting it spring up again, the loose places, which will move more than the other parts, can soon be seen. If we have a plate with a loose place in the middle, when we try to bend the middle down, the loose part goes down at once, more than the adjacent parts; but if we have a plate with a tight place in the middle, the edges will move most readily, because they are loose, and if we try to bend the middle down, it comes up above the edges.

It should be borne in mind that when tight and loose places exist in plates, or sheets of metal, they are indicative of defects which will tend to become exaggerated under the partial application of heat, until they produce those hollows and protuberances which are both unsightly and inconvenient. With saws, it is particularly desirable that these defects should be removed at an early period, since they may otherwise give rise to cracks. It is convenient, when a loose place has been discovered, to draw a ring around it with chalk; and the positions of tight places may be similarly indicated with crosses or zigzag lines. French chalk is useful for marking polished surfaces.

The inexperienced workman should not rashly attempt the straightening of circular saws. The motion of a circular saw tends to stretch it in a direction outwards from the edge, thus increasing its diameter, on the same principle that a ball swung round at the end of a string is continually pulling at the string, and tending to stretch it. The metal at the edge of the saw moves faster than that near the eye, so that it tends to become more rapidly stretched and loosened. As a consequence, the edge of the saw becomes cockled, and the saw wobbles when set in motion. To counteract this tendency, manufacturers make the metal tighter at the edge of the saw, and gradually looser towards the eye; and the workman who attempts to straighten a buckled circular saw should bear this fact in mind, and act accordingly.

To straighten a metal plate which has a cockle or loose place in the middle, the plate should be laid flat upon the anvil, with the hollow side of the cockle uppermost. The workman should then take a hammer with a rounded face—a dog-headed hammer, as it is called, and commence by giving it a series of light taps around the edge of the cockle. The hammering should then be extended further outside the cockle, the force of the blows being at the same time increased. The effect of this process is to stretch or loosen the metal adjacent to the loose place or cockle, so that the latter may become proportionately tightened and consequently flattened. Similarly, if there is a tight place in the middle of a plate, causing the edges to cockle, the hammer should be applied to the tight place, and to the boundaries of the loosened or cockled portions until the cockles disappear. It is often convenient to use the pane or back part of the hammer in removing small cockles. The pane should be a rounded one. The tendency of it is to make trough-like dents or channels in the metal. Of course these must be so slight and so closely distributed as not to produce an undulating surface. The directions of these channels usually coincide with the directions in which we wish to stretch the metal, and their effect can be equalized by making them cross one another at right angles. With these preliminary hints, we will leave the workman to form a practical acquaintance with the subject.

Records Made and Large Contracts Secured.

The Edgar Thomson Steel Works have just finished an order for 500 tons of the largest rails ever rolled in their mill. Each rail is 60 feet long and weighs 1,700 pounds. They have previously rolled rails 60 feet long and cut them in 30 feet lengths, but these are the first they have ever finished at 60 feet.

The Girard Furnace, at Girard, Ohio, was put in blast November 27, 1886, and it has been in continuous blast ever since, with the exception of about eight weeks, when it was banked on account of a coke strike, and from that time until the 1st of August it has made upward of 140,000 tons of metal. The furnace is in good condition, and making from 1,100 to 1,200 tons per week.

Including the product of Saturday, there had been 60,237 tons of pig iron made upon the hearth now in use in the No. 1 stack of the Pioneer furnaces. This, it is stated, is by far the largest amount ever made upon a single hearth in a charcoal furnace. The furnace was blown in on the 27th day of December, 1886, and after deducting the time of stoppages for repairs, the average daily product has been a little above 65 tons. At present the daily product ranges from 77 to 82 tons. Mr. Carroll, the founder, thinks that there is no doubt but the hearth will last until the close of the third year, and that on or before that time 70,000 tons will have been made. The record is a good one in which the founder takes a just pride.—[Negaunee (Mich.) Iron Herald.

Biggest Blast on Record.

At the limestone quarry of Peter Callanan, at South Bethlehem, N. Y., September 2, the largest displacement of rock at one blast ever made in this country was accomplished. Twenty-two thousand tons of rock came crashing down. The force was one ton of dynamite, placed in several holes drilled to the depth of 30 feet in the solid rock.

The Last of the Season.

The Erie Railway will run its last excursion to Niagara Falls and Toronto Thursday, September 12. Special train leaves Central passenger station, South Water street and Viaduct, at 7:30 P. M. Fare to Niagara Falls and return $3.00; Toronto, $1.00 extra. For space in sleeping cars and other information, call or address 141 Superior street or Central passenger station. This will be a good opportunity of visiting the Great Industrial Exposition at Toronto, with all its beauty and splendor.

Harvest Excursions.

On September 10th, 24th and October 8th, 1889, the Pennsylvania lines west of Pittsburgh will sell excursion tickets, at one fare for the round trip, to principal points in the Northwest, West, Southwest and South, good returning thirty days from date of sale. For full information apply to Bingham & Douglass, Weddell House corner.

Half Fare to Toledo.

On the occasion of the Tri-State Fair and Bench Show at Toledo, September 9th to 13th inclusive, the Wheeling & Lake Erie railway will sell excursion tickets from all stations at half rates for adults, and quarter fare for children, carrying all dogs to and from the Bench Show free, in baggage cars.

THE largest piece of machinery exhibited in Paris is a large English lathe, weighing 330 tons, and long enough to swing a piece 70 feet long between centers, and 10 feet in diameter.

AMONG THE IRON MINES.

Lake Superior Mining Notes:—

MENOMINEE RANGE.

L. Stegmiller, of Escanaba, has secured an option on the Fred Mueller place, and adjoining the Iron River mine, at Stambaugh, and has begun exploring. The *Reporter* says it is generally believed, by those who are versed in mining matters, that he will strike a continuation of the same vein that the Iron River mine is working.

The Florence Mining Co. and the the Iron River Mining Co. have consolidated, by the new management, under the name of Florence-Iron River Co. Each mine has shipped over 102,000 tons, the Florence leading by less than 400 tons. Their combined season's output will easily reach 350,000 tons, and many are confident the figures will reach 400,000 tons.—[Mining News.

The Harrison exploration, on the Ingallsdorf townsite, is giving every indication of a large deposit of ore, and the gentlemen composing the company are fortunate in having struck the ore in the first hole drilled. That there is a south lens of ore has been demonstrated beyond question, and it remains only to ascertain its size and length. At the East Vulcan there are two well-defined lenses, at the West Vulcan the same thing holds good, and the recent opening up of a south lens at the Curry, which promises to furnish a large output, is proof positive as far as that property is concerned. At the Briar Hill enough work has been done to prove the existence of a south lens and on this theory the present work of the Harrison was begun. Perhaps the same good fortune will attend work done further west, and there is a large field for future investments. The present drill hole, at the Harrison, is 242 feet deep, and 20 feet of first-class ore has been drilled through.—[Mining News.

MARQUETTE RANGE.

A new find is said to have lately been made near the Salisbury mine, which has promises of being a prominent factor among the mines surrounding Ishpeming. A piece of surface ore taken from the find and analyzed contained over 62 per cent. in good iron. We are informed that the property has been leased from the Iron Cliffs Co., on whose land it is situated, and that a shaft will be sunk and that further explorations will be made immediately.—[Record.

The product of the Republic mine this year is to exceed that of any year since the mine was opened. In 1884, 277,000 tons were shipped, but a portion of this was mined the previous year. Even this shipment will be exceeded by several thousand tons during the current year. While the grand total may not reach 300,000, the estimate that it will reach 290,000 tons is probably a safe one.—[Negaunee Herald.

On Monday, of this week, Mr. Chas. Merryweather, of our city, showed us the result of an assay of the ore from the new discovery in which he is interested, and located about a mile west of the old Saginaw. This gave, metallic iron, 68.97 per cent., phosphorus, .012 per cent., showing it to be a Bessemer of the finest kind. While all the assays made do not show as low in phosphorus, yet those at some feet distant from the hanging wall have nearly all done so. Along the hanging the phosphorus increases in amount. At present the crosscut on the vein is in about 22 feet, showing clean ore the entire distance and without yet striking the footwall. This would indicate the deposit to be of good size. Nothing in the way of drifting has yet been done on the trend of the ore.—[Iron Ore.

GOGEBIC RANGE.

It is stated that the preliminary steps have been taken by W. H. Jacobs, of Milwaukee, to wrest from the Wisconsin Central Railway, section 33, near Hurley, where the Montreal and other iron mines are located. He asserts that the section is outside of the 20-mile indemnity limit, where the road had a right to go, and make up deficiencies in the land grant, and he has claimed possession of the land under soldier script entry. His father is a millionaire, and has engaged Wm. F. Vilas as one of his attorneys. The property is worth $3,000,000, and a great legal fight may be expected. Capt. Samuel Mitchell is operating a valuable mine upon this property, under lease.—[Mining News.

VERMILION RANGE.

The rich iron belt that runs between Ely and Tower in a direction a little south of west, and extends eastward from Ely to the international boundary, has been thought to end at Lake Vermilion. This, however, is far from the true state of the case. West of Lake Vermilion and the phenomenal mines of the Minnesota Iron Co., the ore body trends more to the south, and passes in a southwestern direction almost, if not quite, to the Mississippi river. A little west of the Minnesota mines the ore bodies known as the Vermilion range, on which are all present developments, and the Mesabi range join, making a vast body of ore of great richness. Messrs. Griffitt & Smith, who are owners of a large tract of this rich mineral land, have been in Duluth for a day or two looking up business and conferring with officials of the Duluth & Winnipeg. They have already made arrangements for a branch line to their mines, and the contracts for a ten-mile section, to reach from the main line to the head of the ore bodies, has already been signed, or will be in a day or two. These ore bodies outcrop four miles from the line of the road, and about 100 miles, via the surveyed line, from Duluth. Samples of the ore, as well as assays made, all show remarkable richness and a fine quality of ore. Many of the assays have a showing of 68 per cent. metallic iron, while some are as high as 70 per cent., fully as good as any ore in the Vermilion district. It is also so low in phosphorus to come within the Bessemer limit. It is a much softer quality of ore than that mined at the Minnesota mines, and resembles the Chandler, or several Gogebic ores in many respects.

New Iron Ore Discovery at Pilot Knob:—

The St. Louis Ore & Steel Co., we learn from the *Age of Steel*, have discovered a new, and perhaps very important, body of iron ore at their Pilot Knob mines. It appears that the discovery was made on the Northeastern side of Pilot Knob hill. Six holes were drilled on this part of the property in a "group" at distances of about 600 feet apart, with the result of encountering ore in each instance. That taken from the last hole put down assayed 63 per cent. metallic iron. So pleased were the company with the result of these researches that, according to the *Iron County Register*, they "have begun employing miners for the immediate working of the unearthed vein."

High-Grade Bessemer Ores in Texas:—

Mr. Geo. M. Wakefield, of Milwaukee, writes the *Manufacturers' Record*: "I have been engaged in helping to develop new iron districts for the last 25 years, in Northern Michigan and Wisconsin, and I feel that, without exception, the iron district of Llano and Mason counties is one of the finest on earth, and one of the most easy to be developed and brought into the market. The quality of the ores is best shown by analyses made by Davenport Fisher, of Milwaukee, and by the North Chicago Rolling Mills, of outcroppings from the different localities in Llano and Mason counties:

Iron.	Silica.	Phosphorus.	Manganese	Sulphur.	Titanium.
69.30	3.83	.034	Trace.	None.	None.
67.95	2 89	.024	Trace.	Trace	None.
69.17	2.99	.009	None.	None.	None.
60.49	15.67	.020	Trace.	None.	None.
63.74	10.08	.018	Trace.	None.	None.
67.27	4.83	.018	Trace.	None.	None.
70.25	1.23	.014	Trace.	None.	None.
66.27	2.81	.047	Trace.	Trace.	None.
68.82	2 52	.038	Trace.	Trace.	None.
67.43	4.03	.059	Trace.	Trace.	None.
71.15	.25	.008	.....	.....	.....
71.27	.34	.018	.....	.....	.....
70.18	.19	.001	.....	.....	.....
65.97	3.04	.001	.....	.....	.....
65.43	4.01	.018	.....	.....	.....
67.83	1.91	.020	.....	.....	.....

Mr. Wakefield also mentions "two manganese properties, one of which is probably one of the finest that has ever been found, and this property I have tested very thoroughly with a diamond drill, having cross-cut the vein in 21 different places and showing a width of between 8 and 9 feet, on an average, varying from 3 to 15 feet at the different places where it was cross-cut. A portion of the manganese is very rich indeed, and I should judge, from the work that has been done, about one-half will show 58 to 62 per cent.; the other half, where it is more mixed with quartz, will show by analysis from 30 to 45 per cent., making an average of at least 50 per cent."

Lake Superior Shipments of Iron Ore:—

Shipments of iron ore from the mines of Lake Superior for the season of 1889, up to Wednesday, Aug. 28th, are as shown by the appended statement, condensed from the Marquette *Mining Journal:*

MARQUETTE RANGE.

American	11,007	Hartford	524	Prout	3,820
Barnum	3,891	Humboldt	8,871	Queen	35,605
Braastad	68,812	Jackson	40,746	Republic	210,317
Buffalo	23,047	Jackson, pit 7	8,528	Republic Reduction Co.	16,261
Buffalo, South	2,774	Jackson, pit 8	17,719	Salisbury	14,432
Cambria	38,802	Jackson, South	11,110	Salisbury Bessemer	17,305
Champion	126,471	Lake Superior	38,271	Samson	449
Cleveland	147,791	Lillie	23,700	South Buffalo	39,159
Cleveland, Hematite	31,932	Lucy	11,116	Superior	86,766
Cliffs shaft	87,999	Marquette	43,783	Superior, Hematite	60,224
Curry	11,058	Marquette Ore Co	2,721	Volunteer	24,657
Detroit	4,375	Michigamme	19,932	Webster	117
Dexter	3,895	Milwaukee	37,642	West Republic	1,062
East Champion	2,438	Negaunee	55,248	Wetmore	8,792
East New York	11,301	North Champion	7,109	Winthrop	15,623
Grand Rapids	3,701	Pitts. & L. Angeline	147,178	York	11,359
Total, Marquette Range					1,592,066

MENOMINEE RANGE.

Armania	29,462	Hamilton	6,570	Paint River	14,286
Chapin	325,429	Iron River	102,497	Perkins	7,240
Commonwealth	59,364	Ludington	59,848	Shafer	1,189
Cyclops	23,370	Mastodon	37,217	Sheridan	504
Dunn	82,464	Mastodon, South	1,380	Sturgeon River	4,754
Florence	102,743	Millie	8,326	Vulcan	98,309
Great Western	24,771	Monitor	6,365	Walpole	8,573
Half & Half	4,059	Norway	51,734		
Total, Menominee Range					1,062,339

GOGEBIC RANGE.

Anvil	22 759	Iron King	26,854	Pence	51,865
Ashland	138,238	Ironton	2,758	Ruby	5,793
Aurora	125,327	Montreal	3,157	Section 33 south	26,481
Brotherton	45,414	Norrie	379,569	Sellwood Colby	18,159
Cary	27,693	North Montreal	21,125	South Colby	33,811
Colby, Beaver	18,653	North Section 33	9,577	South 15 Colby	10,221
Germania	66,177	Odanah	2,844	Windsor	10,844
Globe	6,095	Pabst	61,126		
Iron Belt	35,226	Palms	11,920		
Total, Gogebic Range					1,159,557

VERMILION RANGE.

Chandler Mine	215,706	Minnesota Iron Co	359,186	Pioneer	2,168
Total, Vermilion Range					577,060
Grand Total					4,401,338
To corresponding date of 1888					2,612,968

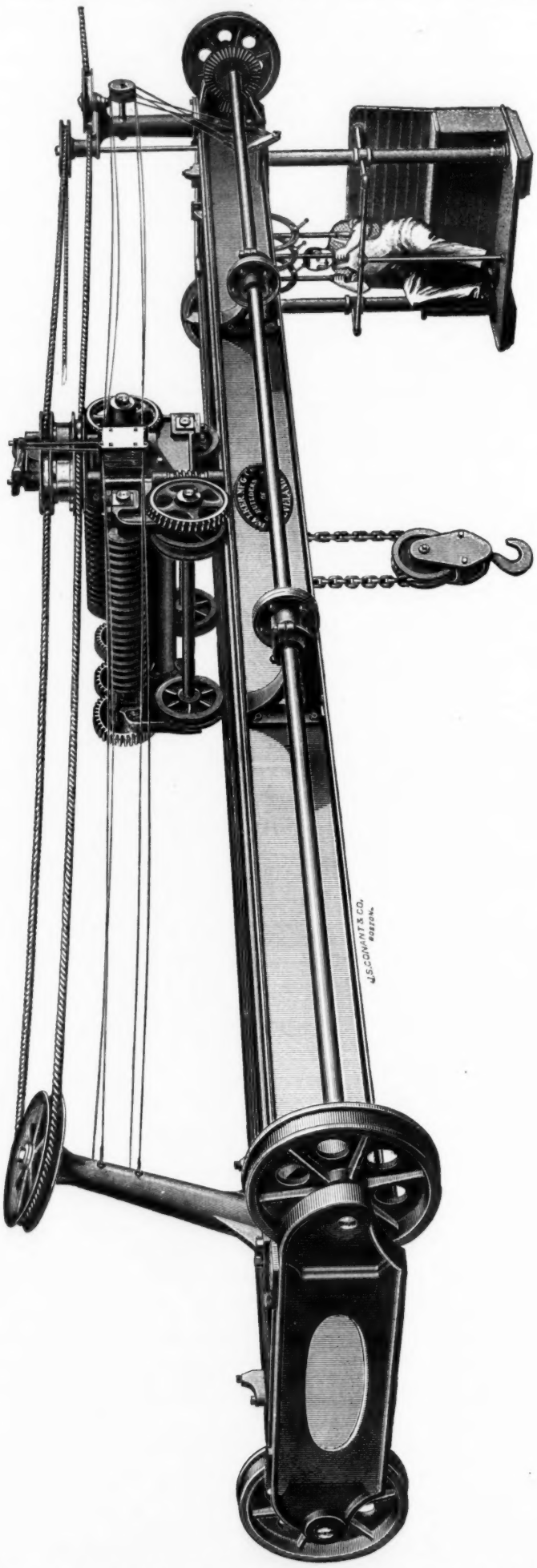
Lake shipments of ore from the iron mines of this region for the week, footed up 228,138 gross tons. This is not up to the work of the preceding week, but exceeds by 46,500 tons the quantity forwarded by water during the corresponding week in 1888, so the mines are still swelling the already large margin by which they are distancing their work of a year ago.

Japanese after American Steel Rails.

Says the Pittsburgh *Dispatch*: M. Fukuzawa, of the Sanyo Railway Co., Kobe, Japan, will visit Pittsburgh within a few days to look over the mills, and especially those making steel rails, with the object of ultimately purchasing in this country rails for from 1,500 to 1,800 miles of railroad in Japan. He was sent over here by the Sanyo Railway Co. nearly three years ago to study railroading, and will return to Japan in about two months. The company now operates a road from Kobe to Bakan, about fifty miles long, but are now arranging to build about 1,500 to 1,800 more miles. The company is composed wholly of Japanese, and has a capital of $3,000,000. M. Fukuzawa said that since the first railroads were built in Japan, the people have "gone crazy" over them and clamor for more. The profits on the 1,000 miles now in the country are enormous, the roads paying as high as 20 per cent. dividends.

IMPROVED HIGH SPEED, ROPE DRIVE, POWER TRAVELING CRANE.

The cut shown herewith represents an improved high speed, rope drive, power traveling crane, of three tons capacity, 30′ 9½″ span, recently built for the Erie City Iron Works, Erie, Pa., by the Walker Manufacturing Co., Cleveland, O. The main girders, forming bridge, are made of steel of the ordinary "I" beam pattern, and secured at their ends in cast end girders, in which are mounted large diameter-flanged wheels for traveling on the main tracks, which



IMPROVED HIGH SPEED, ROPE DRIVE, POWER TRAVELING CRANE.

wheels are made of the best charcoal iron with chilled rims, and secured to short steel axles on one side of the crane, and to continuous cross shaft on the other, so as to insure parallel working of the bridge on main tracks.

The longitudinal traverse of this crane is affected by means of a main driving rope, which is one inch diameter and runs at 2,500 feet per minute along the shop, supported at intervals by carrier pulleys, and turning around sheave on vertical worm shaft—to which is attached a steel worm engaging into worm wheel, and bevel gear with pinions engaged with double ended clutch, all arranged immediately above the cage in the girders, but not shown in cut—along the bridge and back, for the purpose of operating the hoisting, lowering and transverse mechanism by friction sheaves on the trolly. From this vertical shaft, motion is imparted, with bevel pinion and gear, to continuous cross shaft, already explained. The worm and wheel are always in motion with the main rope; the operator introducing clutch to the bevel pinions, already described, with one of the three handles shown to operate the crane.

The trolly, carrying, hoisting and transverse mechanism, is supported on low, steel rails, secured to top of main girders,and consists of strong, cast iron sides, mounted on iron wheels having chilled rims, which are secured to steel axles operating in bronze bearings. The cross traverse and hoisting is effected in either direction by engaging either set of the grooved pulleys—which are driven in opposite directions by the main rope, shown above trolly—with the friction ring, shown between the two pair of pulleys. These friction rings are raised and lowered by the levers shown in front; the upward or downward motion being imparted to same by the $\frac{3}{16}$″ diameter wire ropes passing over and under grooved sheaves, which are set in four independent compartments, there being three sheaves and a connecting rod for each motion, so that by the operator moving the levers, in the cage, in either direction, the two $\frac{3}{16}$″ diameter ropes, operating friction rings, will move them in opposite directions; either of the ropes being tensioned will pull the lever operating its friction ring into the upper or lower pulley as occasion may require.

The hoisting mechanism—Walker's patent—consists of two strong, cast iron barrels, with right and left hand spiral grooves for the chains; these barrels are geared together to run in the same direction, the chains being suspended from their inner surfaces. The hoisting and lowering barrel is twice the diameter of the idler barrel, so that the difference in their circumferences will be the difference in movement of chain; one strand always going up while the other is going down. The principal features of these two barrels, however, are that they are geared together and when the weight is suspended at their inner surfaces, as already explained, same will form a lock on the gears and will hold its load without any tendency to rotate, thus saving strain on worm and worm wheel teeth, and necessitating less power; the hook also is always kept in the center of bridge irrespective of height off chain hook; the chains, when unwound from the barrels, being at opposite ends of same, and when fully wound on barrels, being at the center of each barrel.

The main driving rope, after leaving the driving sheave, passes over upper line of carrier pulleys to tension carriage and back along lower line of carrier pulleys, around the sheave carrying longitudinal motion gearing, and over pulleys for lowering and cross traverse; around idler at end of crane, through the second set of pulleys for cross traverse and hoisting, around idler at further end of crane and along the lower line of carrier pulleys to the main driving sheave, which is located at end of shop and is driven by a friction clutch, from the lever of which a hand rope passes the entire length of main track behind the cage and accessible to the operator to stop main driving rope at will.

The cage is suspended at the end of bridge so that the operator is conveniently located to handle the levers for the various motions and at the same time commanding a view of the entire shop; the seat forming a tool box in which all necessary tools may be kept ready for use. The advantages of this design of crane are, its freedom from noise, ease of working, small amount of power and head-room required, safety in holding the load at all points without brakes or special devices. The crane has few parts, dispensing with expensive head gearing, cross shafts, tumblers, etc.

A Street Car Cable's Record.

The following about a cable that was recently removed from the California street cable road will be of interest: The diameter of the cable was an inch and a quarter when it was laid, but 20 months of constant hauling and wear thinned it down nearly an eight of an inch. Its length was 17,513 feet, and its weight 44,604 pounds. For nineteen hours a day it kept moving every day of the 20 months, and as its speed was seven miles an hour, the distance it traveled was 79,800 miles. It carried nearly 6,000,000 people, or about six times the population of the State, and turned over to the company $300,000 worth of nickels, being at the rate of $15,000 a month or $500 a day. As the total power of the road was 400 horse-power, it may be calculated this rope was doing as much hauling, while in motion, as 200 horses, and as each car hauled by horses uses four teams a day, the daily work of this cable was equal to that of 800 horses, with a deduction, however, for the great power required to move 44,604 pounds of cable. The cable was composed of six strands of steel wire cables, each one containing nineteen wires varying in size from six to eight wire gauge, and twised around a stout hempen core five-eighths of an inch in diameter.—[Pacific Lumberman (San Francisco).

The Doom of Steam.

"The great development in electricity will be, I am firmly convinced," said Mr. Edison to an interviewer in Paris, "in discovering a more economical process of producing it. At present we only get from coal consumed about four or five per cent. of its latent electricity. The rest is wasted in heating water, expanding steam, pushing pistons, turning wheels, and finally causing a dynamo machine to operate. A process will ultimately be found for extracting 90 to 95 per cent. of the latent electricity directly from the coal. Then steam engines will be abolished, and that day is not far off now. Already we can get electricity direct from coal to the amount of 90 per cent., but only for experimental purposes. When I was on ship-board coming over I used to sit on deck by the hour and watch the waves. It made me positively savage to think of all that power going to waste. But we'll chain it up one of these days along with Niagara Falls and the winds. That will be the electric millennium."

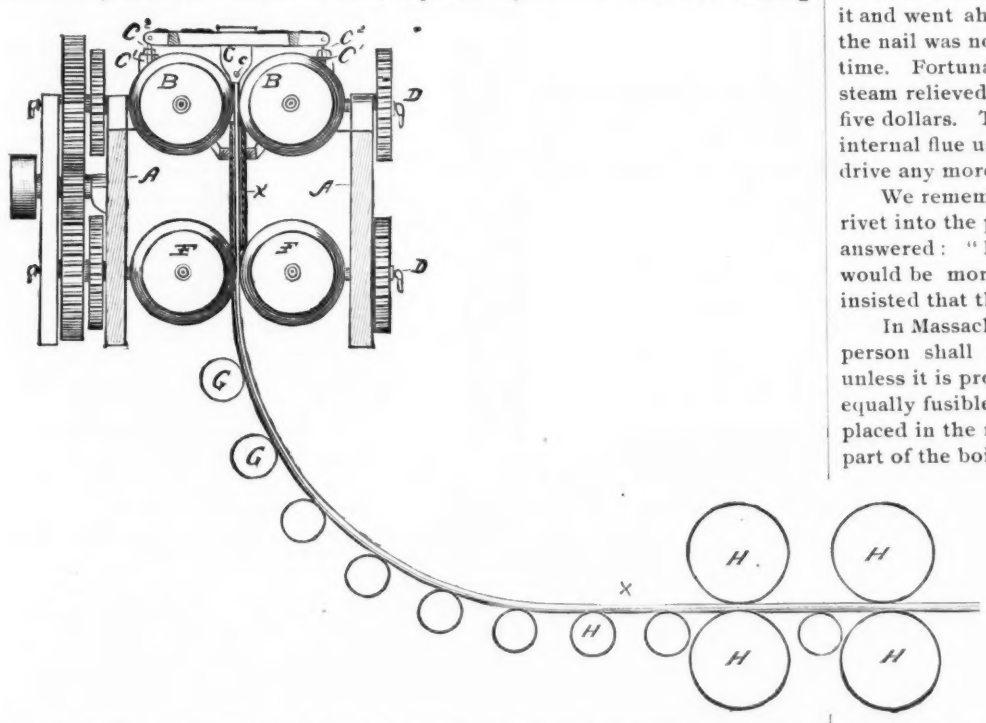
ROLLED BARS DIRECT FROM MOLTEN METAL.

Much curiosity has been aroused by the reports recently emanating from Chicago, regarding a new process for rolling bars or rails direct from the molten metal, and we take pleasure in reproducing herewith an illustration of the process (which is the invention of Elwin Norton and John G. Hodgson, of Maywood, Ill.), together with the principal points in the description as filed in the patent office:

The process consists in pouring a continuous stream of molten metal from a suitable vessel and simultaneously compressing, setting and shaping the metal by its contact with chilling and compressing surfaces or rolls, which confine or surround the stream on all sides as it passes such continuously-moving chilling surfaces or rolls. The chilling surfaces or rolls which shape, compress, and set the metal, and thus convert the molten stream of metal into a metal bar or rail, travel or move at the same surface speed as the velocity of the flowing stream of molten metal, so that the molten metal will not dam up or collect between the rolls, and so that the molten metal or bar produced will come in contact with the rolls or chilling surfaces only at a single point, so to speak, at a time.

The metal bars or rails, it will be thus seen, are produced directly from the molten metal, and without first casting the metal into an ingot and heating and rolling and rerolling it; and as the molten metal is poured in a continuous, solid stream into what may be termed a continuously revolving or traveling metal chilling or compressing mould, which comes in contact with only one point, or a very limited length of the metal stream or bar at a time, and is continuously traveling in the same direction with the stream or bar, point after point in the whole length of the metal stream or bar coming successively in contact with this traveling or revolving compressing and chilling mould, the metal bars or rails are of course produced in continuous lengths, and the process or operation is continuous so long as the stream of metal flows.

In the accompanying figure A represents the frame of the machine, on which is journaled a series of rolls, B, preferably four in number, revolving



together and having their peripheries shaped or grooved to form a passage or way between them to receive the stream of molten metal as it flows down from the pouring bowl or nozzle, C.

The working or meeting faces or peripheries of the rolls, B, are given a shape or configuration to form an ordinary railroad rail. They may, however, be shaped to give the space or passage any desired cross section, and thus produce a bar of any form required. The rolls, B, have beveled faces, which meet or roll against each other and serve as stops for the several rolls against each other, so that the space or passage for the metal will always be maintained of a uniform size, and thus produce the rail or bar of a uniform cross section throughout. The rolls, B, are each made hollow, and preferably with a central web, and the shafts are also made hollow, so that the water or other cooling fluid or liquid may be made to circulate through each of the rolls for the purpose of keeping them cool or of the desired temperature. The hollow shafts are each furnished with a packing or stuffing-box at each end, by which they are connected with the inlet and outlet water pipes, D D'. The pouring bowl or vessel, C, is supported by any suitable means above the rolls, B, during the pouring operation, preferably by standards C', furnished with adjusting screws, C^2. The pouring nozzle, C, is preferably furnished with a valve or device for opening and closing the discharge passage. The hollow shafts of the rolls are all geared together, so that they revolve or roll together at the same surface speed. The gearing employed may preferably be bevel gears, such as indicated at B^3. Two of the shafts, B^2, are also geared together by spur gears, B^4, E is the driving shaft, having a gear, E', which meshes with a gear, E^2, on one of the shafts, B^2. The pouring bowl or nozzle, C, is furnished with a guide or shield, extending down to near the meeting point of the rolls. This is designed to prevent the metal from splattering at the beginning of the pouring operation. A greater or less number of rolls than four may be employed.

F represents a second series of rolls arranged, preferably, directly below the chilling rolls, B, and between which the bar, *x*, passes as it issues from the chilling rolls, B. Rolls, F, are preferably of the same form and construction as the rolls, B, being hollow and having the same connections for passing water through them, so that they may operate as chilling rolls as well as to further roll, compress, and finish the rail or bar produced.

G is a curved guide or conveyer consisting, preferably, of a series of rolls or idle pulley wheels, arranged in a curved path to curve and guide the bar as it issues from the rolls, F, to the horizontal conveyer or series of rolls, H. Some of the rolls, H, are preferably driven and operate to further roll or straighten the rail or bar, as well as to convey it along or away. The curved guide, G, also affords some slack in the rail or bar between the chilling rolls and rolls, H H, to compensate for difference in speed or slipping.

ON FUSIBLE PLUGS.

THE LOCOMOTIVE.

The fusible plug is one of the most abused appliances to be met with around boiler rooms. It is so small, and in such an out-of-the-way position that there is a great temptation to let it take care of itself. Again, it is so seldom heard from that a fireman who is not very watchful is liable to forget about it. Yet, when it is properly cared for, the fusible plug is a most important safeguard.

In the event of an explosion, too, it often furnishes valuable evidence concerning the immediate cause of the explosion. Thus, after the disastrous explosion at the Park Central Hotel, in Hartford, Conn., described and illustrated in the March *Locomotive*, the fusible plug was found intact; and by placing it in a retort, and carefully ascertaining the melting point of the filling, it was easily shown that at the time of the explosion the water in the boiler was several inches over the tubes. That is, direct proof was obtained that the water in the boiler was not lower than it should have been.

In a certain boiler, in the South, one day, the water got low, and, of course, the fusible filling melted out and gave the alarm. The owner not having time to have it refilled, and not having another one on hand, drove a nail into it and went ahead as usual, until the water got low a second time; when as the nail was not any more fusible than the boiler, both got red hot at the same time. Fortunately this caused such a leak around the nail that the escape of steam relieved the pressure somewhat, and the repairs cost only about seventy-five dollars. The boiler was 42 inches in diameter and 8 feet long, with an internal flue used as a fire-box. The chances are that the owner will not drive any more nails into fusible plugs.

We remember another instance, in which the fireman had driven an iron rivet into the plug in a similar manner. When we remonstrated with him, he answered: "By gar, she do be melting out all the time." We told him if he would be more watchful of his water-line that would not happen, but he insisted that the water had never been low since he had been fireman.

In Massachusetts the law concerning safety plugs reads as follows: "No person shall manufacture, set up, use, or cause to be used, a steam boiler, unless it is provided with a fusible safety-plug, made of lead or some other equally fusible material, and of a diameter of not less than one-half an inch, placed in the roof of the fire-box, when a fire-box is used, and in all cases in a part of the boiler fully exposed to the action of the fire, and as near the top of the water-line as any part of the fire-surface of the boiler. * * * Whoever, without just and proper cause, removes from a boiler the safety-plug thereof, or substitutes therefor any material more capable of resisting the action of the fire than the plug so removed, shall be punished by fine not exceeding one thousand dollars. Whoever manufactures, sets up, or knowingly uses or causes to be used for six consecutive days, a steam boiler unprovided with a safety fusible plug * * shall be punished by a fine not exceeding one thousand dollars." And it seems to us that it would be wise to have similar laws in all the States.

When fusible alloys are used for filling safety-plugs, it is found that their melting point is often considerably raised by long exposure to the heat. The exact cause of this rise in the melting point does not appear to be clearly known. It has been suggested that the metals composing the alloy are gradually separated or crystallized out from one another by the prolonged action of heat. However this may be, it is certain that pure Banca tin is a much more reliable material to use for filling. As tin is an element its melting point remains constant, and it is low enough—420° Fah.—to adapt it perfectly for use in fusible plugs.

In order to prevent delay, in case a plug should melt out, all owners of boilers should see to it that extra ones are constantly kept on hand, so that they may be put in place at short notice.

A Modern Fable.

One day an Elephant saw, for the first time, a Stork standing upon one Leg. "Well, well," mused the Elephant, "that seems very sensible. What is the use of my using all four legs at once? Better use one at a time and rest the other three. May my Tusks turn into Vegetable Ivory," continued the apt old Pachyderm, "if I don't try that." So up he Jumped on one of his Hind Legs, and Enjoyed the sense of triumph for about one-thousandth part of a Second, at the expiration of which period he lost his balance and Slid down a Sand Hill with such Speed that you couldn't tell where the Elephant commenced or the Landslide ended. Having rubbed an acre of Sand out of his Eyes, he said: "The Moral of this Fable Should teach you that it will not do to Tinker with a One-Legged Free Trade when you have Four good Protection legs to stand on!"—[Dixie, Atlanta, Ga.

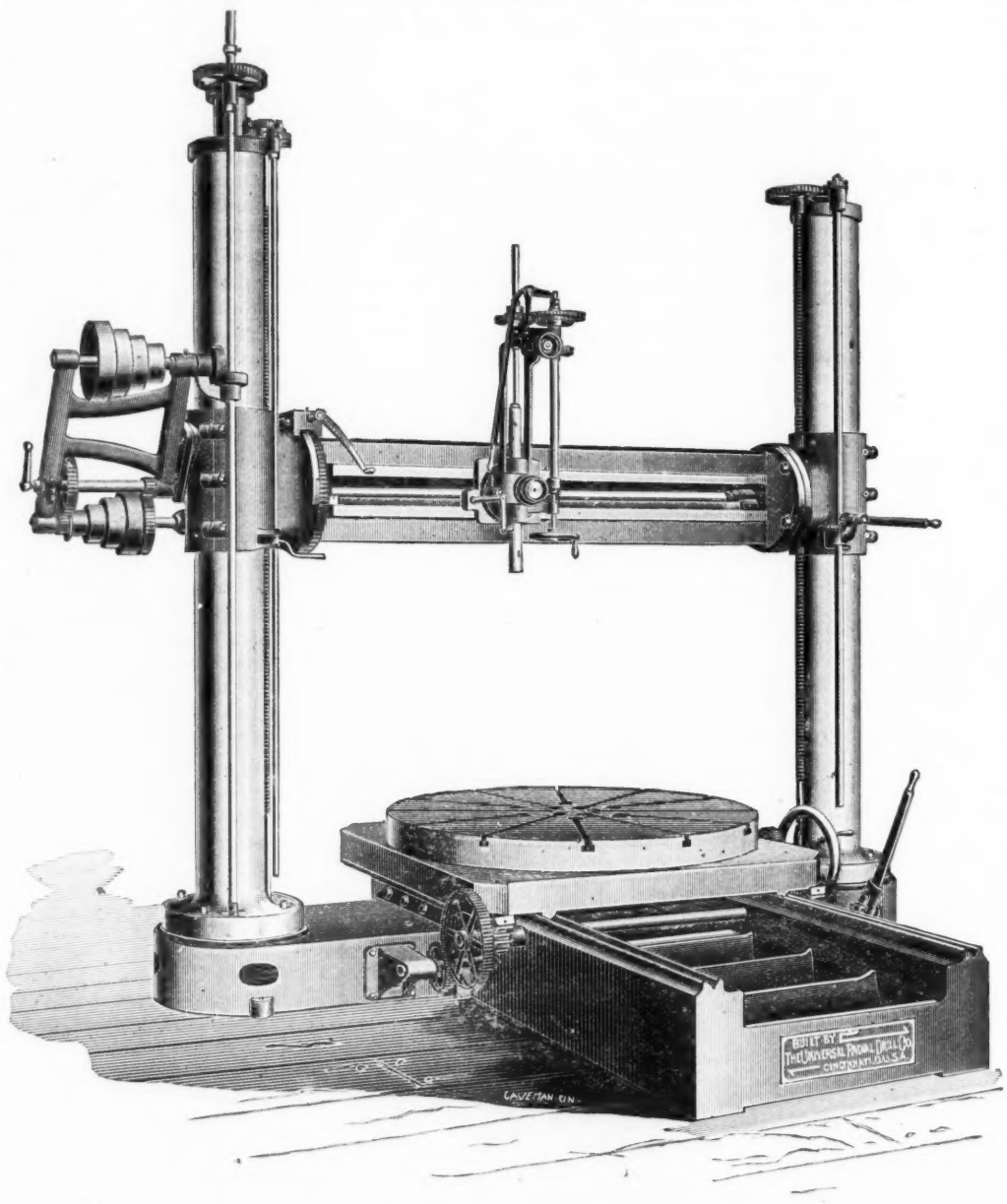
PYROLINE makes wood and textiles fireproof.

UNIVERSAL BEAM DRILL.

A noteworthy improvement in machine tools, recently brought out, is the Universal beam drill, with double column, herewith illustrated. Following are the general dimensions:

Columns, 13 inches diameter, 12 feet high; total height of machine, 14 feet 5 inches; distance between columns, 9 feet 10 inches; spindle 2⅞ inches diameter, 24 inches traverse; distance from spindle to chucking table, 8 feet 7 inches; horizontal travel of head, 6 feet 1½ inches; diameter of revolving chucking table, 6 feet; travel of square table, 6 feet; total width of base 13 feet 6 inches; length of shears, 10 feet 4 inches and weighs about 26,000 lbs.

In operation work is placed upon the round chucking table, and by the traverse of the square table on the shears it is run under the spindle, and as the head travels horizontally on the beam, and round table can be revolved to any point, it is easy to bring the spindle to any desired place on top of the work. When top drilling is finished, both tables are run forward on the shears, the beam is lowered to an approximate position by power, then swiveled till the spindle is in a horizontal position, when side drilling upon the work can then be done, and on one or all sides of any piece of work, by revolving each side or face of the work into position before the spindle. There is a hand movement for delicate adjustment of the beam in a vertical line. Both the revolving chucking table and square table have clamping device to secure them in proper position. This drill is manufactured by the Universal Radial Drill Co., Cincinnati, O., who will furnish all desired information.



UNIVERSAL BEAM DRILL.

Iron and Its Seven Lives.

"Iron has eternal life," said James M. Swank, general manager of the American Iron and Steel Association, recently. "When the king of metals is taken from the ground, it is not used up and cast into the waste heap. Once worn out it is remanufactured, passes into a new shape, and is really never altogether consumed. Old stoves are burned out, but they are melted down again and recast for another term of service. Horseshoes are worn away, carriage-tires wear out, engine boilers and all the iron and steel parts of the locomotive fail sooner or later, street tracks give away after a certain amount of traffic has passed over them, but all the worn-out metal goes back to the furnace and the rolling-mill, and is soon seeing a new existence, strong and servicable as ever."

The truth which Mr. Swank thus gave expression to is one of foremost interest to manufacturers of iron and steel. It means that iron, once taken from the ground, is forever in the market. At all the great trade centres there are regular quotations of old rails, both iron and steel, and scrap iron. Sometimes the current prices of old and new steel rails approach closely, and at such a time there is a tendency among the railroads to replace their roadway with new and heavy steel.

In every quarter of the United States the "old iron" man is found holding forth in a junk-shop, or on a more pretentious scale. All the manufactured forms of iron and steel that have passed their prime are gathered in. The railroads are very large sellers of old iron, but from a dozen other quarters the supply comes. Not the shrewdest man in the iron business can pretend to estimate how much of the yearly output of iron manufactures and steel is made from remelted old material, and how much from new ores fresh taken from the earth.

The proportion of the former, however, is certainly immense, and sure to increase with a powerful momentum as the development of the country goes on and the generations of iron multiply.

"It is the long life of iron," remarked General Manager Swank, "that makes our manufacturers so very hostile to foreign importations. When iron and steel are once brought into the country they are here to stay forever, keeping from the consumers native iron which otherwise would go to supply the demand. The arguments for proptection, however forcible, are tenfold strong in the case of iron and steel products. Coal is consumed, wooden manufactures have a short life, textile goods fall to pieces on the backs of the wearers, but the supply of iron, once brought into use, is a constant quantity.

"So heavy is the supply of old iron and steel offering that some manufacturers are almost ready to believe that as time goes on no more iron ore need be taken from the earth. The existing supplies will be self-replenishing, and iron and steel workers will only have to remold, remake, remanufacture. As long as there is in any country a large growth in population and in the uses of iron and steel, this era will be delayed, but should these factors become stationary, the mines of iron ore may remain buried in the bowels of the earth; the many millions of tons of metal above ground will serve to satisfy new needs."—[Philadelphia Record.

Self-Running Engine.

There seems to be a growing tendency on the part of some builders of improved engines to advance and maintain the point, that their special type of machine requires no skill, on the part of the operator, to work it, often using such arguments as a proof of the superiority of their goods and as a reason why they deserved consideration beyond that accorded to luckless competitors. It is the stock argument of some engine builders that a skilled engineer is not essential to the safety and economy of their engine, thereby placing at a discredit the very men to whom they must look for successful handling of their work. True, a well-made Corliss or Automatic cut-off engine will, when new, if let alone, perform the duty required of it, but continued perfection cannot be expected in any engine, and it is then that the skillful engineer demonstrates his value as compared to the unskilled.

Another question that is worthy of the most serious consideration on the part of steam users who are contemplating the purchase of improved engines, which the builders, no doubt, claim will run without an engineer, is that it is the unskilled engineer who constantly "doctors" his engine, not being satisfied to let well enough alone; and the reason is obvious, for it is only the engineer who is thoroughly familiar with his business that knows when things are well enough. It is a libel upon the trained engineer for any man, who, in order to sell his engine, represents that it will not require the service of a first-class man to run it. It is an unfair advantage taken of the buyers of engines to jeopardize their financial interests, by persuading them that a common laboring man is as safe and reliable as a man who has been trained to the trade. The engineer associations should give this matter serious thought, and combat the efforts, constantly being made by unscrupulous men, to disparage their calling and lessen their remuneration.—[American Engineer.

THE September *Century* contains a paper on Napoleon Bonaparte, of unusual interest and importance, being contemporary accounts, by British officers, of the ex-Emperor's exile to Elba. The Lincoln installment is crowded with absolutely new material, and has to do mainly with Lincoln's triumphant re-election. Apropos of the latter portion of the Lincoln history is the article by Justice Bradley, of the Supreme Court, on Chief-Justice Marshall, accompanying a rare portrait of the great Chief-Justice, by the French artist, Memin. An article appropriate to the season is Mr. Hamilton Gibson's ingenions and original study of butterfly and plant life, accompanied with illustrations by the author.

THE tubular steel passenger car, which has been for some time under construction at Boston, has been sent to Laconia to have the inside fittings put up. The car will be finished in a handsome style, with non-combustible fittings and upholstering.

INDUSTRIAL SUMMARY.

New Enterprises:—

The Lozier & Yost Bicycle Manufacturing Co. has been incorporated; capital stock, $125,000.

The C. C. Wormer Machinery Co. has filed articles of association with the county clerk of Detroit county, Mich., with a capital stock of $15,000. The incorporators are C. C. Wormer, Chas. J. O'Hara, Stephen Moore and Geo. W. Moore.

The Mechanical Boiler Cleaner & Manufacturing Co. has been organized at Mattoon, Ill.; capital, $30,000. The stockholders are W. D. Ewing, T. A. Allen and others. They will manufacture the Hornish boiler cleaner and other machinery.

A press dispatch from Greenbrier, W. Va., under date of 23d ult., says: "The Glenmore Iron Co., recently organized, and the plant for whom is about completed, will begin operations Monday next. The company have strong backing from Eastern capitalists. It has been developed that the Greenbrier county iron ore is first class."

The Carp river furnace property at Marquette, Mich., will be started up again, providing Marquette citizens will contribute $30,000 towards the enterprise. The company proposes increasing its capitalization from $100,000 to $150,000, by issuing 2,000 additional shares. It is estimated that $30,000 will put the plant in shape for business.

It is quite probable that in the near future there will be established in Pittsburgh a large works for the manufacture of water works supplies, such as valves, hydrants, etc. Mr. W. M. Dodds, representing a number of New York capitalists, was in the city last week, looking up Pittsburgh's natural advantages. Mr. Dodds said that several Pittsburgh capitalists had joined the proposed company, and he was shown around by them while here. He would not give their names, however, until his return and the arrangements were definitely made. The capitalization of the company is to be about $500,000. —[American Manufacturer, Pittsburgh.

Enlargements, Additions, Removals, etc.:—

The Springfield (O.) Machine Tool Co. expect to build a new foundry.

The J. B. Miller Lock Co., Kent, O., design increasing their capital stock from $50,000 to $100,000.

The Union Steel Screw Co., Cleveland, will make extensive improvements in their plant.

Auburn Foundry Co., Auburn, Me., have built a 50 foot wing to their foundry, this season, and enlarged the capacity of the works. They have had a busy season, and are now at work on plenty of orders.

The Knowles Steam Pump Co. will at once enlarge its shops, at Warren, Mass., by building addition. The foundation for the new building is being put in by the Flynt Building & Construction Co., of Palmer.

The old Snowden rolling mill property, at Brownsville, Pa., has been purchased by a company composed of Pittsburgh and Brownsville capitalists. The mill will immediately be repaired and remodeled, and operations commenced as soon as practicable.

J. P. Witherow has closed a contract with the Sharon Iron Co., of Sharon, for three Whitwell hot blast stoves, each 18x60 feet, with draught stacks each 6x150 feet. This work is to be completed within three months, and will keep Witherow's works, Pittsbrugh, on full time, double turn.

The Duff Co. Steam Forge Works, at Troy, O., have decided to accept a new location at West Superior, Wis. To obtain this new accession, several business men offered the works a tract of land, valued at $15,000, with a cash bonus of $5,000 in addition. The machinery of the plant will be removed as soon as details of the transportation can be completed. The building which will accommodate the concern will be 150 feet in length and 70 feet in width. Two trip-hammers will be put in, one with 16-inch face and another of 8-inch. The company look forward with confidence to a good business in marine boiler construction, and all wrought iron products. In the manufacturing of shafting, too, the plant will produce as high as 20-inch, which will meet the demand anywhere.

Carnegie Bros. & Co., Limited, of Pittsburgh, have commenced the erection of two additional blast furnaces, at Braddock, Pa., which will be known as furnaces H and I. The furnaces will be 80 feet in height and 20 feet in diameter at the bosh, and will have a capacity of about 250 tons per day each. Work is being prosecuted vigorously, and it is expected that Furnace H will be ready for blast by April of next year. The completion of these two stacks will give the above firm a total of nine stacks at Braddock. Furnace F has been blown out, and is now being relined and otherwise repaired. When it is blown in again, Furnace G will be blown out for relining and repairs.

W. E. Case and A. F. Ward, formerly of Toledo, O., where they were until recently engaged in the production of specialties in brass, have removed to Newcomerstown, O., where they have secured new premises and fitted them out with the latest and most approved machinery for the purpose of carrying on the business of general machinists and founders. The title of the new company will be the Oxford Machine Works. The company will, at an early date, bring out several new specialties in iron and brass, for which patents are pending, and are at present actively engaged in the erection of a foundry building.

Fires and Accidents:—

Baltimore.—Coates' plate rolling mill at Locust Point. Loss, $15,000; fully insured.

New Bedford, Mass.—Edmund Grinnell's iron foundry. Loss, $20,000; two-thirds insured.

The boiler shops of the Bigelow Co., at New Haven, were totally destroyed by fire on the 23d ult. The engine and rivet shops also caught fire, but the firemen, after several hours' work, saved the main portions of the buildings. Loss about $75,000; partly insured.

The rolling mill and nail factory at Towanda, Bradford county, Pa., operated by Bostley, Godcharles & Co., was partially wrecked, August 27, by the explosion of a boiler, the disaster resulting in instant death of five men, the fatal injury of two others, and the slight injury of a dozen other workmen.

General Industrial Notes:

The Crane Iron Co., of Catasauqua, are experimenting with the Bookwalter process, having put up one converter.

The Baldwin Locomotive Works, of Philadelphia, have turned out their ten thousandth engine. It is a consolidation engine for mountain service on the Northern Pacific railroad.

The Spiral Weld Tube Co., of East Orange, (office New York City) has secured the contract for furnishing sixty miles of natural gas mains to the City of Toledo, O. Owing to other large contracts ahead and the short time allowed for delivery, the company has been obliged to sublet a part of the order to other competitors.

William F. Jarvis & Co., of Detroit, Mich., have taken the exclusive sale of the entire output of the Katahdin Charcoal Iron Co., of Bangor, Me. The new line of the Canadian Pacific Railroad reaching this furnace, gives it an advantageous outlet for the Western market, where it will probably be largely sold, although William F. Jarvis & Co. will also represent it where it is already well known, viz: in the Eastern market.

The Fulton foundry, Cleveland, is supplying all the track material for the University Park, Berkley Park rapid transit and the Tramway street railways, Denver, Col.; also for the Wyatt Park and Peoples, both electric railways, St. Joseph, Mo. Besides the company is furnishing material for Grand Island, Neb.; Topeka, Kas.; and has an order for the equipment of Bethany Hights road, an entirely new line to be put down in Lincoln, Neb.

The McKaig Iron & Steel Shafting Works, this city, received from New Jersey, yesterday, an order for another car load of shafting of their improved make. They have just completed the shipment of seven car loads of shafting to various points in the United States. They are now filling an order for a car load of this celebrated shafting, to be shipped to Washington Territory, and also a large order for the United States Navy Yard at Mare Island, California. Shipments of it having recently been made to Cuba, City of Mexico and Texas.—[Cumberland News, June 29, 1889.

The United States Pipe Bending & Coiling Co., Chicago, manufacturers of the pipe-bending machine illustrated in these columns August 29, write us as follows: "The machine is also being used for bending bar and round iron into different shapes, it having been found well adapted for those purposes, although not thought of when the machine was first constructed. It can be adapted to bend either round or square iron as well as pipe, in fact, the company is now considering the making of a larger and heavier machine for the purpose of bending steel rails to fit curves on railroads; the power is in the machine, it only a matter of making one heavy enough to do the work."

Among other improvements recently made by the Walker Manufacturing Co., Cleveland, O., one of great importance has been the building of a very large pit lathe, capable of turning work up to 30 feet diameter by 8 foot 6 inch face. This lathe is a combination tool, it being not only a pit lathe, but also a huge planer, in which surfaces 30 feet long by 8 feet 6 inches wide can be planed. It also has facing attachments for the proper facing up of the ends of columns and girders. In addition there are gear planer attachments, whereby the teeth can be planed in gears of any size up to 30 feet diameter, and of any proportions desired. This tool places the Walker Manufacturing Co. in the best possible shape for the production of this heavy class of work. The company inform us that business is looking quite bright with them.

Messrs. A. Wyckoff & Son, Elmira, N. Y., inform us that they have just closed a contract with the Williamsport Heating Co., for patent steam pipe casing to cover an extension of their works. Messrs. Wyckoff have recently shipped the following parties: C. H. Gridley & Co., Elmira, N. Y.; Northern Central Railroad Co.; Wm. Kirkup & Son, Cincinnati, O.; Rutzler & Blake, New York; Brazil Block Coal Co., Brazil, Ind.; L. H. Prentice & Co., Chicago, Ill.; Robert Clayton, Davenport, Ia.; Unexcelled Fire Works Co., New York; Rich Hill Coal Mining Co., St. Louis, Mo.; Chas. Ashley, Ogdensburg, N. Y.; E. H. Jones & Co., Cleveland, O.; J. & J. Rodgers Iron Works, Ausable Forks; Oliver Lucas, Louisville, Ky.; Center Iron Co., Bellefonte, Pa.; Walworth Construction & Supply Co., Boston; Philadelphia Exhaust Ventilator Co.; Wilkes Barre Heat, Light & Motor Co.; Arnold Ore Co., Ferrona, N. Y.

The Sweet & Clark Co., Marion, Ind., manufacturers of malleable iron, was formerly located at Troy, N. Y., but recently moved their entire plant to Marion, in order to avail themselves of natural gas as a fuel. They have one of the most complete foundries, for the manufacture of malleable iron, to be found in the United States. This company, for years, has made a specialty of curry-combs and saddlery hardware. The buildings cover almost five acres, and are all built of brick. Following are the dimensions of the various buildings: hardware factory, 180x60; annealing room, 200x60; foundry, 254x70; japaning room, 60x25; pattern safe, 20x20; core room, 20x50. The engine is a 75 horse-power and built by the well-known firm of B. W. Payne & Son, Elmira, N. Y. The plant was completed in 1888, and it is only lately that the company has been in shape to place its products on the market. The following are the names of officers of this company: W. M. Peckham, President; W. O. Anderson, Secretary; Jay Williard Clark, Vice-president and General Manager; Chas. J. Clark, Treasurer; C. L. Wheeler, Superintendent malleable department; A. R. Perry, traveling salesman. The company is peculiarly fortunate in securing the services of so popular a man, "on the road," as Mr. Perry. Among recent contracts is one for the malleable castings for 500 cars for the Pennsylvania Railroad Co. The company melt entirely with natural gas, having succeeded where others have failed in this respect, and possessing such favorable conditions, are prepared to make very close figures.

THE RENAISSANCE OF THE CANAL.

We have heard a good deal lately about the abandonment of canals on account of the greater cheapness of railroad transportation, especially in the United States. No wonder our canals are being abandoned, for, such as they are, with their miserable towpaths, small cross-section, unstable banks and mule motive power, they are relics of the days of the stage coach, and it is high time they gave place to something modern. There will be a reaction here, as well as in England, some day in favor of canals, but they will be ship canals, with steam for motive power, and capable of floating the largest vessels. The Nicaragua Canal is the first one we need, to give us cheap transportation between the Atlantic and the Pacific. If the British and Canadian governments can afford to spend hundreds of millions of dollars in building the Canadian Pacific Railroad, in establishing docks at Esquimault, and in subsidizing steamships from Vancouver to China and Australia, what should not we be able and willing to do to tie together by water our Eastern and Western sea coast.

The Erie Canal has been one of the greatest causes of the prosperity of New York City and State. It is capable of doing yet more for both, and the most far-sighted and liberal policy should be adopted in regard to its enlargement. After the Erie and the Nicaragua canals may come the Florida and the Cape Cod ship canals, on our coast; the James River and Kanawha Canal, to connect the Ohio River with the Atlantic Ocean; the Hennepen Canal, to connect the Lakes with the Mississippi, and the proposed canal, between Lake Erie and Pittsburgh, to connect the lakes with the Ohio. If it pays England to put a ship canal between Liverpool and Manchester, what would it not pay us to build these more important canals in America?—[Engineering & Mining Journal.

Canada's Industrial Exposition.

This exposition will open September 9th and close September 21st. The Erie Railway will run its last excursion of the season to Niagara Falls and Toronto, giving those who desire, an opportunity of visiting this "Great Fair." A special train will leave the Central passenger station Thursday, September 12th at 7:30 P. M. Tickets good five days. Round trip to Niagara Falls, $3.00; Toronto, $1.00 extra; with privilege of stopping off at Chautauqua. For sleeping car space, and other information, call or address 141 Superior St., or Central passenger station South Water St. and Viaduct.

LIST OF PATENTS.

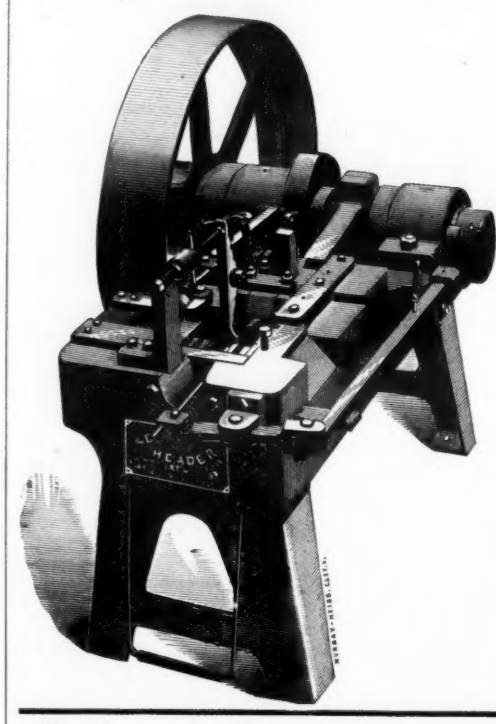
Relating to Iron, Steel, Metal, Machinery, Hardware and Mining Interests.

Reported expressly for this paper by H. T. Fisher, (late Ex. U. S. Patent Office), Patent Attorney, 34 Blackstone Building, Cleveland, O.

PATENTS BEARING DATE AUGUST 27, 1889.

Bending metal bars, machine for, T. F. King, Baltimore, Md.
Blower for furnaces, C. A. Goyne, Ashland, Pa.
Ceiling, metal, F. G. Caldwell, Wheeling, W. Va.
Lathe having a supplemental drill spindle, turret, J. Hartness, Torrington, Conn.
Metal, attaching composition of matter to, C. T. Lee, Boston, Mass.
Metal rolls, J. T. Hastings, Chicago, Ill.
Metal pile or fagot, H. W. Borntraeger, Pittsburgh, Pa.
Metal sawing machine, C. C. Newton, Philadelphia, Pa.
Metallic wheel, G. H. Everson, Pittsburgh, Pa.
Nickel, refining, P. Mahnes, Lyons, France.
Rolling flanges, beams, mill for, J. Kennedy and H. Aiken, Homestead, Pa.
Screw machine, metal, G. A. Fairfield and G. E. Witherell, Hartford, Conn.
Turn-buckles, making, J. A. Simpson, Pittsburgh, Pa.

Seaton Header.



This cut represents our

Track Bolt Header

BEST ON EARTH.

CAPACITY from two to five tons in ten hours, according to heating capacity.

FINISH of bolt equalled by few.

No skilled labor required to feed it.

We build **HEADERS** for other special work.

—FOR—

Bridge and Ship Builders,

RAILROAD SHOPS, ETC.

MACHINE AND CARRIAGE BOLTS.

Seaton M'f'g Co.,

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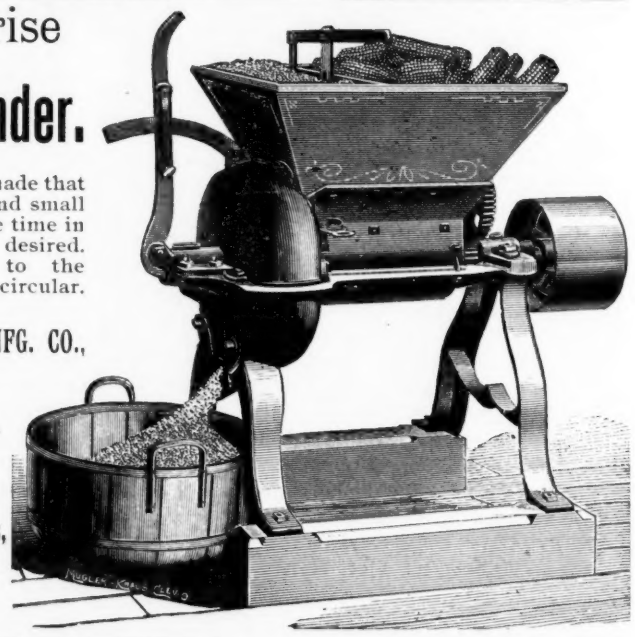
Enterprise

Feed Grinder.



The only mill made that grinds ear corn and small grain at the same time in any proportion desired. Liberal prices to the trade. Send for circular.

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COLUMBIANA, O.

—WE MAKE—

Feed Mills, Saw Mills,

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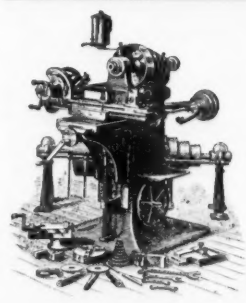

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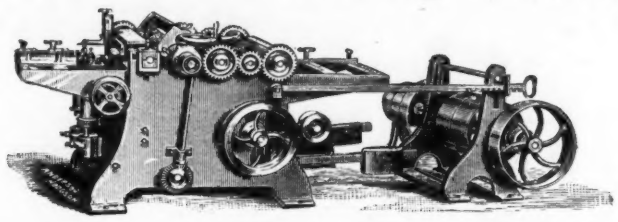

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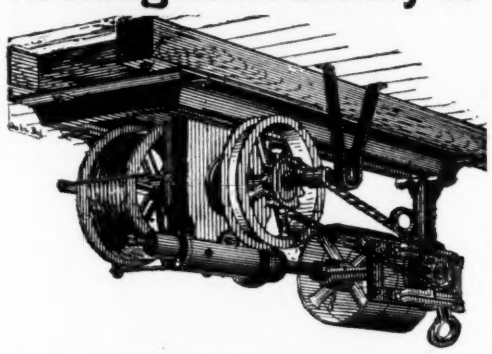

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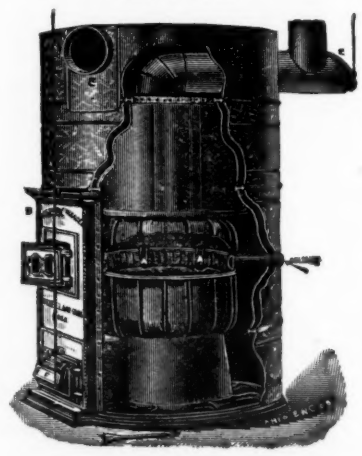

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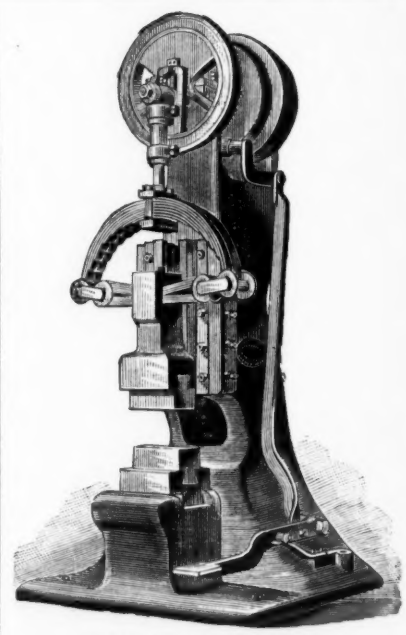

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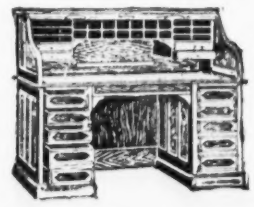

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LOUISVILLE (reported by Geo. H. Hull & Co.): Southern Coke No. 1 Foundry (new classification), $15 00@15 50; Southern Coke No. 2 Foundry (new classification), $14 50@15 00; Southern Coke No. 3 Foundry (new classification), $13 75@14 25; Grey Forge, $13 25@13 75; White and Mottled, different grades, $12 75@13 25; Silver Grey, different grades, $13 25@13 75; Southern Charcoal No. 1 Foundry, $16 50@17 00; Southern Charcoal No. 1 Mill, $15 00@15 50; Southern Car Wheel, Standard brands, $22 00@23 00; Southern Car Wheel, other brands, $18 25@19 75; Hanging Rock Coke No. 1 Foundry, $15 75@16 25; Hanging Rock Charcoal No. 1 Foundry, $19 75@21 25; Hanging Rock Cold Blast, $21 00@23 00; Hanging Rock Warm Blast, $00 00@00 00.

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DETROIT (reported by William F. Jarvis & Co.): Lake Superior Charcoal, all Numbers, $19 25@19 75; Lake Superior Coke, all Ore, $18 50@19 50; Lake Superior Coke, Cinder Mixed, $17 50@18 00; Standard Ohio Black Band, $17 50@18 50; Southern No. 1, $17 00@17 50; Southern Gray Forge, $15 50@16 00; Southern Silvery, $16 50@17 00; Jackson County (Ohio) Silvery, $18 00@18 50; Old Wheels, $18 00@19 00.

PITTSBURGH (reported by A. H. Childs): No. 1 Foundry, $17 00@17 50; No. 2 Foundry, $16 00@16 50; Grey Forge, $15 25@15 75; White and Mottled, $14 25@14 50; Warm Blast Charcoal, $18 00@25 00; Cold Blast Charcoal, $22 00@28 00; Bessemer, $17 75@18 00.

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1¼ & 1⅜ by ⅜ to ¼ inch	1 85
1 & 1⅛ by ⅜ to ¼ inch	1 85
⅛, ¼ and ⅜ by ⅜ to ⅝ inch	2 25

Round and Square.

to 1⅜ inch	1 75
to 2⅝ inch	1 95
2¼ to 3¼ inch	2 25
3⅜ to 4 inch	2 75
⅛ to 4½ inch	3 25
4¼ to 5 inch	3 45

Oval.

⅛ to 1¾ inch	2 15
⅛ to ¾ inch	2 35
⅛	2 55
⅛	2 95

Half Oval and Half Round.

⅛ to 3 inch	2 85
⅛ to 1¼ inch	2 45
⅛ to ¾ inch	2 95
⅛	3 25
⅛	4 75

Heavy Band.

⅛ to 6 by ¼ and 5-16 inch	1 95
1 to 1⅜ by ¼ and 5-16 inch	2 05
⅛ to ⅞ by ¼ and 5-16 inch	2 25
⅛ to ⅜ by ¼ and 5-16 inch	2 75

Hoops.

1¼ to 4, Nos. 13 to 15	2 55
1¼ to 2, Nos. 16 to 18	2 65
1¼ to 2, No. 19	2 75
1¼ to 2, No. 20	2 85
1¼ to 2, No. 21	2 95
1¼ to 2, No. 22	3 05
15-16, 1 and 1⅛, Nos. 13 to 15	2 75
15-16, 1 and 1⅛, Nos. 16 to 18	2 85
15-16, 1 and 1⅛, Nos. 19 and 20	2 95
15-16, 1 and 1⅛, No. 21	3 05
15-16, 1 and 1⅛, No. 22	3 25
⅞, Nos. 13 to 15	2 95
⅞, Nos. 16 to 18	2 05
⅞, Nos. 19 and 20	2 15
⅞, No. 21	3 25
⅞, No. 22	3 35
13-16, Nos. 13 to 15	3 15
13-16, Nos. 16 to 18	3 25
13-16, Nos. 19 and 20	3 35
13-16, No. 21	3 45
13-16, No. 22	3 55
¾, Nos. 13 to 15	3 25
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¾, Nos. 19 and 20	3 45
¾, No. 21	3 55
¾, No. 22	3 65
11-16, Nos. 13 to 15	3 45
11-16, Nos. 16 to 18	3 55
11-16, Nos. 19 and 20	3 65
11-16, No. 21	3 75
11-16, No. 22	3 85
⅝, Nos. 13 to 15	3 85
⅝, Nos. 16 to 18	3 75
⅝, Nos. 19 and 20	3 95
⅝, No. 21	4 05
⅝, No. 22	4 15
⅝, No. 23	4 25

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1½ to 6 by ⅛ to 3-16 in	2 25
1½ to 6 by Nos. 11 and 12	2 35
1 to 1⅜ by ⅛ to 3-16 in	2 35
1 to 1⅜ by Nos. 11 and 12	2 45
⅞ and 13-16 by ⅛ to 3-16 in	2 65
⅞ and 13-16 by Nos. 11 and 12	2 75
¾ and 11-16 by ⅛ to 3-16 in	2 95
¾ and 11-16 by Nos. 11 and 12	3 05
⅝ and 9-16 by ⅛ to 3-16 in	3 25
⅝ and 9-16 by Nos. 11 and 12	3 30
½ by ⅛ to 3-16 in	3 50
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No. 27	3 15
No. 28	3 35

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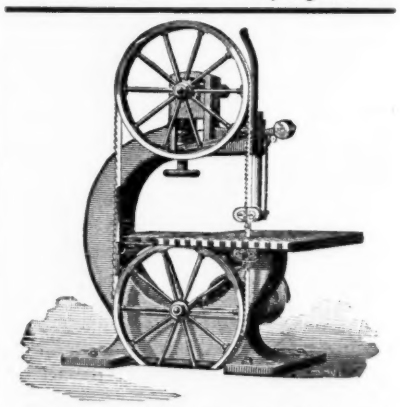

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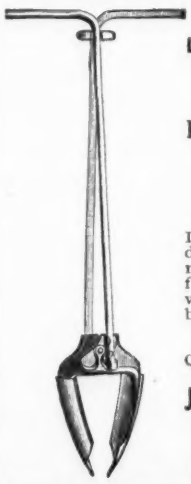

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Borax.

.....₩ lb 9½@10½

Chalk.

White.....₩ gross 50
White Crayon.....₩ gross 12@12½ dis 10
Red.....dis 70
Blue.....dis 85

Chucks.

Cushman's 4 Jaw Independent.....dis 40
" Combination.....dis 40
" Geared Scroll.....dis 30
" 2 Jaw Brass Workers.....dis 25
" Drill.....dis 35
Wescott's Scroll Combination.....dis 30
" Independent.....dis 40
" Little Grant Drill.....dis 30
Horton's Universal & Ind.....dis 40
National Combination.....dis 40
Sweetland " .....dis 40
Skinner " .....dis 40
" Independent.....dis 40
Almond Drill.....dis 25
Morse " .....dis 15
Skinner " .....dis 30

Cutters and Reamers.

Cleveland.....dis 10@15
Pratt & Whitney.....dis 10@15
Standard.....dis 10@15
Brown & Sharpe, Milling Cutters.....dis 15
" " Gear Cutters.....dis 15

Crowbars.

Cast Steel.....₩ lb 4
Iron, steel points.....₩ lb 3½

Drill and Drill Stocks.

Twist drills.....dis 50&10
Morse Taper and Straight shank to 1½".....dis 50&10
Morse Taper and Straight shank Larger than 1½".....dis 25
Drill Sockets.....dis 25
Standard.....dis 50&10
Cleveland.....dis 50&10
Maneer's bench.....dis 50&25
Maneer's post.....dis 50&10

Emery.

	No. 4 to 46 gr.	No. 54 to 150. gr.	Flour, F.	C. F. FF.
Kegs, ₩ lb	4 c	5 c		2½c
½ kegs ₩ lb	4¼c	5¼c		2¾c
¼ kegs ₩ lb	4½c	5½c		3 c
10 lb cans, 10 in case	6 c	6½c		5 c
10 lb cans, less than 10	10 c	10 c		7½c

Emery Cloth and Paper.

Barder, Adamson & Co.....dis 40@46
H. H. Barton.....dis 40@46

Emery Wheels.

Detroit.....dis 50@60
Norton's.....dis 55@60
Grant.....dis 55@60
Union Stone.....dis 60
Sterling.....dis 60
Vulcanite.....dis 15@20
Celluloid.....dis 10
Northampton.....dis 55
Crystal.....dis 65@70
Vitrified.....dis 60

Files.

Nicholson.....dis 60&10@60&10&10
" X. F.....dis 25
Kearney & Foot.....dis 60&10@60&10&10
Black Diamond.....dis 60&10@60&10&10
Arcade.....dis 65@70
Disston's.....dis 65@70
Western.....dis 70
Stub's.....dis 25
Grobet's.....dis 30
Reynolds Bros.' Hand Cut.....dis 50

Hammers.

P. S. W.....dis 40
Atha new list, Jan. 15, 1887.....dis 50
Heavy hammers and sledges under 5 lbs. 18c over 5 lbs 14c, new list.

Jack Screws.

Illinois Bolt Co. list.....dis 70

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4¼	4	3¼	3½
Hexagon	15½	11½	8½	6	5¾	5¼	5
Washers	9	8	7	5	4½	4½	4½

In lots less than 100 lbs, ₩ lb add ½c., 1 lb boxes add 1c to list.

Nails (wire.)

List July 14, 1887.....dis 70 &10
Standard Penny Nails, ₩ keg card rate { Car lots.....$2.30 / Less than car lots $2.40

Oilers.

Zinc and Tin.....dis 60
Brass and Copper.....dis 50
Malleable (Hammer's), No. 1, $3.60; No. 2, $4.00; No. 3, $4.40 ₩ doz.....dis 10@10&10

Packing, Steam.

Boston Belting Co.....dis 60
American Packing Hemp.....₩ lb 10@11
Russia Packing " .....₩ lb 14
Italian Packing " .....₩ lb 13@14
Plumbago Piston.....₩ lb 40
Morrison's " .....₩ lb 50
Square Flax " .....₩ lb 70
Sheet Rubber.....₩ lb 12@24
Excelsior Rubber.....₩ lb 48

Picks.

Railroads, 5 to 6 lbs.....$12 dis 60
" 6 to 7 lbs.....$13 dis 60

Pulleys.

Iron Pulleys, Walker List.....dis 45
Medart Pulleys.....dis 55
Split Wood Pulleys.....dis 45

Rivets.

Iron, Thousand, list November 17, ...dis 50
Iron, Ordinary, Cooper's Block and Carriage list November 17.....dis 50
Copper.....dis 50@50&10

Rope.

Manilla, ½ inch and over.....₩ lb 15¼
Sisal, ⅛ inch and over.....₩ lb 13¼

Sand Paper.

B. A. & Co.....dis 40@40&10
H. H. Barton's.....dis 40@40&10
New England Flint.....dis 40@40&10
Barton's Garnet.....dis 25

Saws.

Disston's Circular.....dis 45
" Band.....dis 20
" Scroll.....Net
Hack Saw Stubs.....dis 20
" " Eureka.....dis 20
" " Star.....dis 20
Saw Swages Disston's.....dis 20
Atkins' Cicular Saws.....dis 50
" Mill, Mulay and Drag Saws..dis 40&10
" Wood Saws.....dis 40&10
" Silver Steel Diamond Cross-cut Saws.....dis 70c per ft
" Dexter Cross-cuts.....dis 50c "
" Diamond " .....dis 30c "
" Tuttle Tooth Cross-cuts..dis 25c "
" One-man Cross-cuts.....dis 32c "
No. 1 Handles.....dis 23c per pair
No. 6 " .....dis 16c "
Excelsior Saw Tools.....$6 per doz
Perfection " .....$15 "

Screws.

Wood Screws—List Jan 27, 1889.

Flat head iron.....dis 50
Round head iron.....dis 40
Flat head brass.....dis 45
Round head brass.....dis 35
Square Cap.....dis 65
Hexagon Cap.....dis 60
Set C. H. C. P.....dis 70
Machine, flat head, iron.....dis 55
Machine, round head, iron.....dis 50
Bench and hand—
Lag or coach.....dis 75@75&10
Coach, patent gimlet point.....dis 75

Shovels and Spades.

Ames' list November 1, 1885.....dis 20
Dennis.....dis 5.25
Hussey & Binns, railroad.....dis 8.00

Taps.

Cards, Hand and Nut to 2 in.....dis 50
Carpenters' " " " .....dis 50
Morse " " " .....dis 50
Pratt & Whitney " " new list dis 10
Machine Screw Taps.....dis 55
Pipe Taps to 2½ in.....dis 70
Stay Bolt Taps.....dis 25
Stove Bolt Taps.....dis 50
Pulley Taps.....dis 40

Twine.

	BC.	B.
No. 12, Flax Twine,	¼ and ½ lb Balls	21c@29c
No. 18 "	¼ and ½ "	18c@28c
No. 36 "	¼ and ½ "	16c@27c
2-Ply Hemp, ¼ & ½ lb Balls (Spring Twine)		11½c
3-Ply "	1 lb Balls	12@12¼c
3-Ply "	1½ lb Balls	11@11¼c
Cotton Wrapping, 5 Balls to lb		15@16c

Vises.

Solid Box.....dis 60
Parker's.....dis 20@25
Prentiss.....dis 20
Stephen's.....dis 25@30
Barrett's.....dis 30
Miller's Falls.....dis 40
Merrill's.....dis 10@15
Howard.....dis 30
Maneer's machinist.....dis 50&10

Wire.

New List, Jan. 18, 1884

Brass and copper.....dis 20@25
Bright and annealed, Nos. 0@18...dis 70&10&75
" " Nos. 19@26..dis 75@75& 5
" " Nos. 27@36..dis 75&10& 5
Coppered Nos. 0 to 18, market list..dis 70@70& 5
Galvanized Nos. 0 to 18 " " .....dis 65&5
Tinned market Nos. 0 to 18.....dis 67½
Cast steel.....dis 50
Tinned Broom Wire.....dis 70&5@70&10
Annealed Fence, Nos. 8 and 9.....dis 75
Annealed Grape, Nos. 10 to 14.....dis 75
Stub's Steel Wire regular.....$6.00@lb dis 30

Wrenches.

Coe's genuine, cash in ten days.....dis 50
Girard Standard.....dis 70&10
Agricultural.....dis 75&10
Mechanics'.....dis 55&10.& 3
Bemis & Call's Combination.....dis 35
Donohue's Engineers.....dis 20&10
Lamson & Sessions Engineers.....dis 60
Billings & Spencer's Drop Forged.....dis 10
William's " " .....dis 10
Alligator " " .....dis 40

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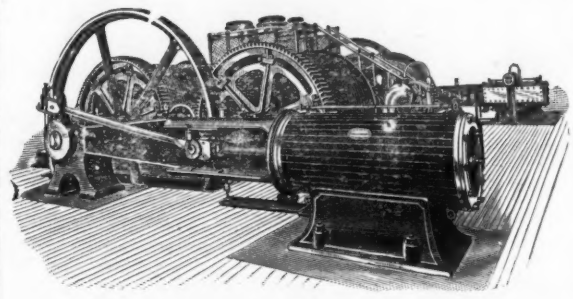

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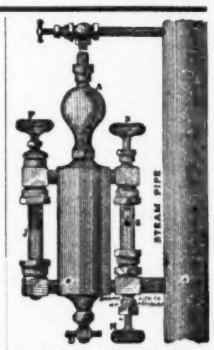

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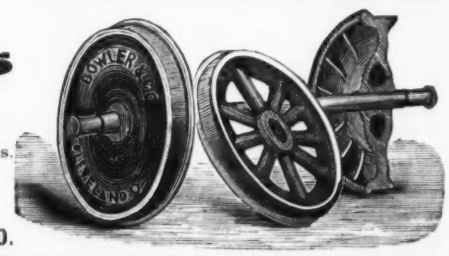

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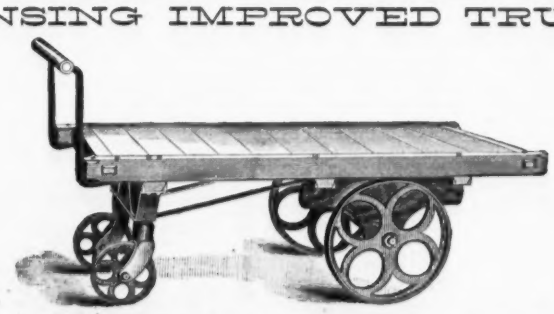

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nell's.....dis 60&5
Cook's Douglass Mfg. Co.....dis 55
Russell Jennings' augers and bits.....dis 25
Expansive Bits, Clark's small, $18; large, $26.....dis 35@35&5
Hollow Augers, Ives'.....dis 25&10
Hollow Augers, Bonney's Adjust. ₩ doz., $48.....dis 40&10
Hollow Augers, Stearns' Adjust. ₩ doz., $48.....dis 20&10
Gimlet bits, common.....per gross $2 75@3 25
Standard Bit Stock Drills.....dis 50&10&5
Ship Augers.....dis 15&10@15&10&5

Axes.

Makers' and Special Brands—
First quality.....₩dox. $6 00@6 50
Others.....₩doz. $5 50@5 75
Full polished.....$8 00

Bolts.

Cast iron barrel bolts.....dis 70@70&10
Cast iron shutter bolts, etc.....dis 70@70&10
Cast iron chain bolts.....dis 65&10
Ives' patent door bolt.....dis 60
Wrought iron barrel bolts.....dis 70@70&10
Wrought iron square bolts.....dis 70@70&10
Wrought shutter bolts.....dis 60&10
Sargent's list
Carriage, common, new list.....dis 75&10
Tire, common, new list.....dis 70
Carriage and tire, Philadelphia pattern.....dis 75&10
Stove bolts.....dis 62½
Plow bolts.....dis 60&5
Machine.....dis 75&10@80
Ends.....dis 75&10&80

Buckets, Elevator.

.....dis 50&10

Butts.

Wrought brass.....dis 70@70&10
Cast brass, loose joint.....dis 33⅓&10
Cast Iron—
Fast joint, narrow.....dis 50&10&5@60&5
Fast joint, broad.....dis 55&10&5@60&10
Loose joint.....dis 70&10@75
Loose joint, jap.....dis 70&10@75
Loose joint, jap. with acorns.....dis 70&10@75
Loose pin, acorns.....dis 70&10@75
Loose pin, japanned acorns.....dis 70&10@75
Loose pin, acorns, jap. plated tips..dis 70&10@75
Wrought steel—
Wrought, fast joint, narrow.....dis 70&10@75
Wrought, fast joint, broad.....dis 70&10@75
Wrought, loose joint, broad.....dis 70&10@75
Table Butts, back flaps, etc.....dis 70&10@75
Regular inside blind.....dis 70&10@75
Light inside blind.....dis 70&10@75
Loose pin.....dis 70&10@75
Light loose pin.....dis 70&10@75

Chains.

Trace, 6½-10-2.....₩ pair 1.03
Trace, 6½-10-3.....₩ pair .92 } 50&10@50&10&5
Trace, 7-10-2.....₩ pair 1.11
German Halter Chain, list June, 1887...dis 50&10
German Coil, list of June, 1887..dis 50&10&5@60
Galvanized Pump Chain.....₩ 5½@46
Jack Chain, Iron.....dis 75@75&5
Jack Chain, Brass.....dis 70@70&5

Chisels.

Socket Framing and Firmer.....dis 75&5@75&10
Socket Framing and Firmer, Buck Bros..dis 30
Socket Firmer and Framing, L. & I. J. White.....dis 30@30&5
Tanged Firmers.....dis 40&10

Cutlery.

Table.....net
Excelsior Pocket.....net

Gimlets.

Nail and Spike.....dis 50&10&5
Double cut, low list.....dis 25
"Bee".....₩ gross $12, dis 25@25&5

Hangers.

Barn door, old patterns.....dis 10&10@70
Climax, (Anti-Friction).....dis 70
Star.....dis 40&10@40&10&5
Scranton.....dis 40
Kidder's.....dis 50&10@60
Terry's Patent.....5 in., $12; 4 in., $10. dis 50&5
Paragon.....dis 40&10
Richard's.....dis 30@30&10

Horse Nails.

	No. 10	9	8	7	6	
Ausable, ₩ lb.	23	24	25	26	28	dis 25&10@25&10&10
Putnam, ₩ lb.	18	19	20	21	23	dis 15
Essex						dis 25&10@25&10&10

Horse Shoes.

Burden, at factory.....₩ keg $4 00
R. I. Horshoe Co., Perkins' Imp. at factory.....₩ keg $4 00
Mule Shoes, at factory.....₩ keg $5 00

Knobs.

Carriage, japanned.....₩ gross 80c dis 60&10
Base, rubber tip.....dis 70&10&5
Hemacite door knobs, new list.....dis 40&10@50
Door mineral.....dis 65C@68C
Door Por. japanned.....dis 75C@78C
Door Por. nickle.....$2 00@2 25
Door Por. plated.....$2 00@2 25

Locks, Bolts, Etc.

P. & F. Corbear, Locks and Bronze Goods.
Door locks, knobs and latches.....dis 60
Escutcheons and keys.....dis 60
Padlocks and padlock keys.....dis 66⅔
Bell pulls, mineral, porcelain and jet.....dis 60
Bell pulls, genuine bronze.....dis 60&10
Lever bell pulls, genuine bronze.....dis 60&10
Butts', genuine bronze.....dis 60&10
Butts' bronze plated.....dis 60&10
Store door locks and latches.....dis 60&10
Store door handles.....dis 60&10
Shutter hinges&flaps,genuine bronze.dis 60&10
Shutter hinges, bronze plated.....dis 70
Flush bolts, genuine bronze.....dis 70
Shutter knobs. genuine bronze.....dis 50
Shutter bars, genuine bronze.....dis 60
Sash lifts, genuine bronze.....dis 60
Sash pulls and plates, genuine bronze.....dis 60
Push plates, genuine bronze.....dis 60
Drawer pull, genuine bronze.....dis 66⅔
Letter box plates, genuine bronze....dis 60&10
Barn door locks.....dis 33⅓

Plumbs and Levels.

Standard list.....dis 70&10@70&10&10
Pocket levels.....dis 70&10@70&10&10
Davis' inclinometers.....dis 10&10

Pumps.

Cistern, best makers.....dis 50&10@60
Pitcher spout, best makers.dis 60&10@60&10&10
Pitcher spout cheaper goods dis 70&5@70&10&5

Pokes, Animal.

Bishop's I. X. L.....₩ doz $6 50
Bishop's O K.....₩ doz $5 50
Bishop's Pioneer.....₩ doz $3 75
Bishop's American.....₩ doz $3 00

Rakes.

Cast steel.....dis 65
Malleable.....dis 70@70&5

Razors.

J. R. Torrey Razor Co.....dis 20
Wostenholme & Butcher.....$10@40...dis 10
Rifle razor.....dis $9 50 net

Scales.

Hatch, Counter, No. 171.....₩ doz $21 00
Hatch, Tea, No. 161.....₩ dox $6 75@7 00
Chatillon's Grocers.....dis 50
Family Turnbulls.....dis 30@30&10
Scale Beams, List of January 12, 1882.....dis 50&10@50&10&4

Screw Drivers.

Stanley R. & L. Co.'s Varnished Handles.....dis 65&10
Stanley R. & L. Co.'s Black Handles..dis 60&10
Sets interchangeables.....₩ doz $18 dis 25

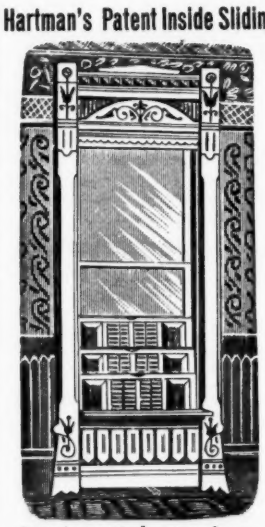
Squares.

Steel and iron.....
Nickel plated.....} dis 75&10@80
Disston's try square and T bevels.....dis 45&10
Winterbottom's try and miter.....dis 30&10

Tacks, Brads, Etc.

New List, January 2, 1888.
American iron carpet tacks all kinds.....dis 80@80&5
Steel carpet tacks all kinds.....dis 80@80&5
Swedes iron carpet tacks, all kinds.....dis 80@80&5
Swedes iron tacks.....dis 75&5@75&10
Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
Tinned Swedes iron tacks..dis 75&10@75&10&5
Tinned Swedes iron Upholsterers' tacks.....dis 75&10@75&10&5
American iron cut tacks.....dis 75@75&10
Copper tacks.....dis 50&10
Copper finishing and trunk nails.....dis 50&10
Cigar box nails.....dis 50&10@50&10&5
Finishing nails.....dis 70&10@70&10&10
Hungarian nails and miners' tacks.....dis 70&10@70&10&10
Gimp and lace tacks.....dis 75&10@75&10&5
" " " tinned.dis 75&10@75&10&5
Trunk and clout nails.....dis 70&10@70&10&10
Tinned trunk&clout nails.dis 70&10@70&10&10
Basket nails.....dis 70&10@70&10&10
Chair nails.....dis 70&10@70&10&10
Common and patent brads.dis 70&10@70&10&10
Tinned capped trunk n'ls..dis 70&10@70&10&10

Hartman's Patent Inside Sliding Window Blind



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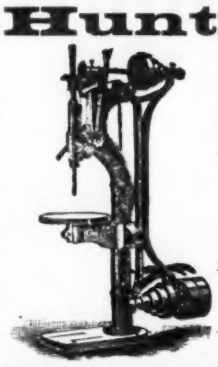

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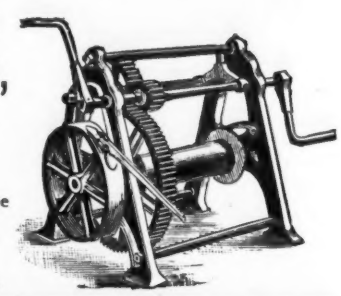

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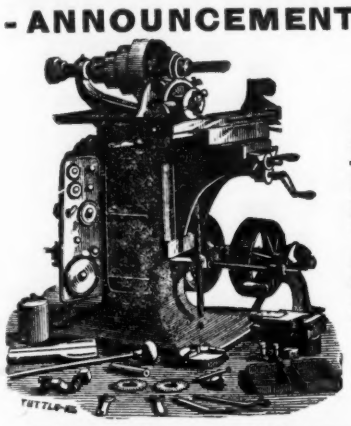

We received GOLD MEDAL for our New Universal Miller at the N. O. Exposition. (See cut.)

We have the pleasure of notifying our customers and friends that we have secured a long lease of the new building at Laight and Canal sts., and shall take possession about April 1.

Our new quarters contain about 45,000 square feet of floor room, and has light on three sides. We therefore shall have increased facilities for manufacturing and executing any orders that we may be favored with. Our plant will be a modern one, and all necessary tools for the proper and expeditious finishing of work will be introduced as fast as required

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ANIMAL POKES

They prevent animals from breaching or being injured by barbed wire. Best in the market. Recent valuable improvements. Prices low. Factory extensive and reliable. Send for catalogue and price list.

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12 to 80 HORSE POWER.

Adapted to HEAVY, CONTINUOUS WORK.

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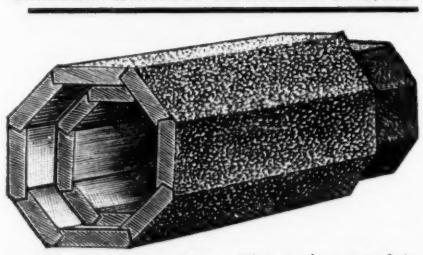

A section of our new Steam Pipe Casing complete.

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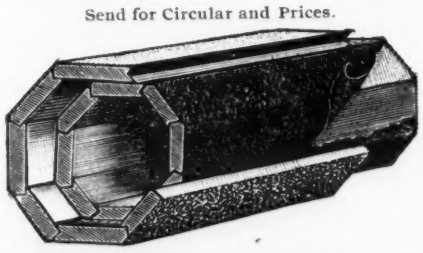
Patent Steam Pipe Casing

For Underground Steam Pipes.

Send for Circular and Prices.



Two staves removed to show the lining between the inside and outside staves.

Steam Jet Pumps,	**From**	**$4.00 up.**
Automatic Injectors,	**"**	**$5.00 up.**
High Lifting Injectors,	**"**	**$6.00 up.**
Shafting, Hangers,	**"**	**$1.00 up.**

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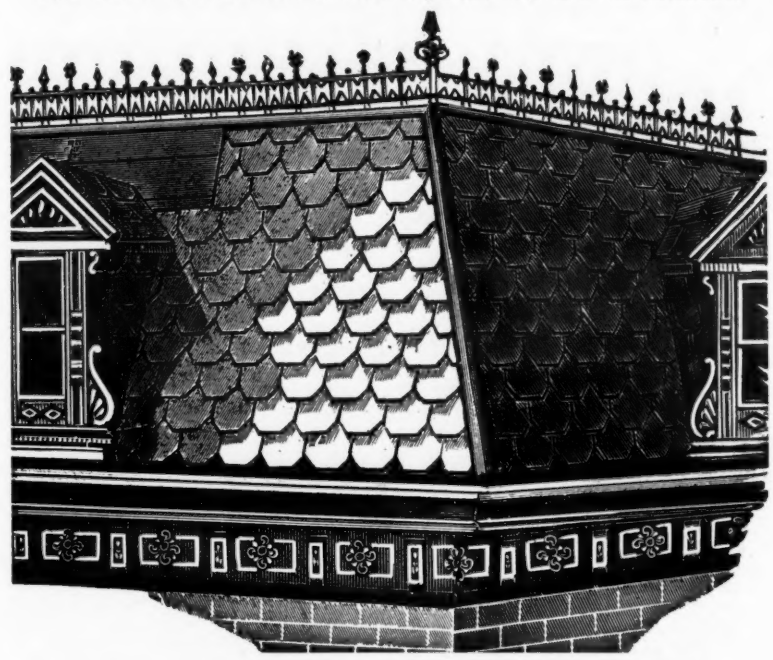
"EASTLAKE"

Metallic Shingles and Siding!

THE BEST ROOFING FOR CHURCHES, SCHOOLS AND RESIDENCES.



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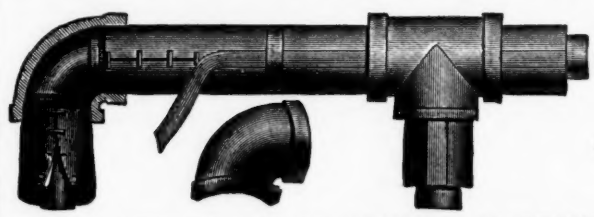

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MINERAL WOOL

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Coverings and Asbestos Goods of all kinds.

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Mention this paper.

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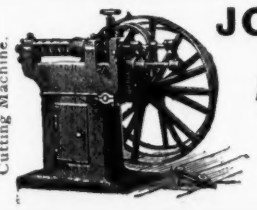

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Builders of Machinery for Hardware Manufacture.

Automatic Wire Straightening and Cutting Machines,

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THE - ARMSTRONG - PURIFIER,

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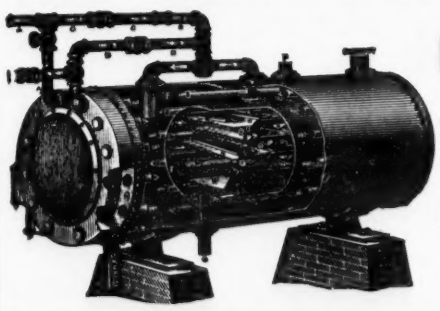

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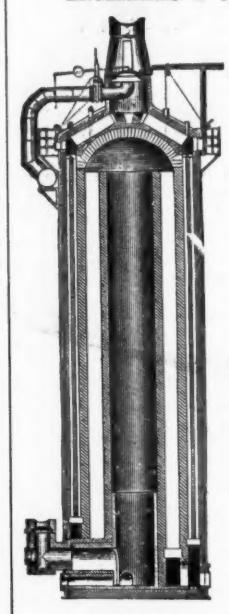

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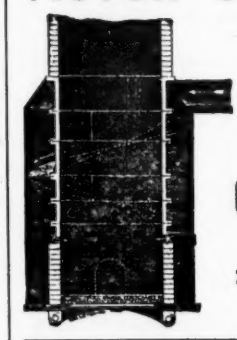

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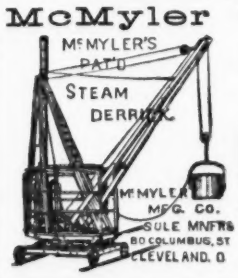

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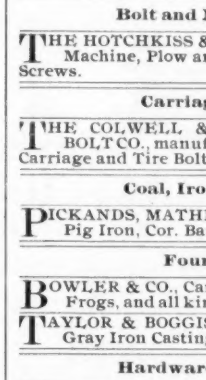

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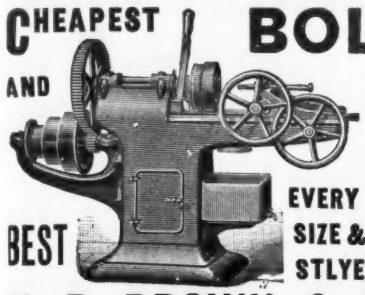

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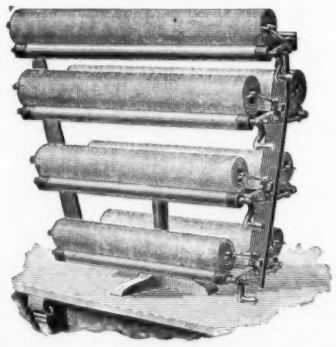

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Office and Wharf 23 River St.

	ARRIVE.	DEPART.
Detroit Steamer	†5 00 a. m.	10 00 p. m.

For Mackinac and Lake Huron ports take Thursday's steamer. City ticket office 224 Bank street. †Daily except Sunday.

FOR THE BEST AND LOWEST PRICED GANG LATH MILL AND BOLTER COMBINED.

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Than any other Route.

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TRAVELERS' REGISTER.

Standard Time.
Revised March 6th, 1888.

N. Y., C. & St. L. R. R. Co.—"The Nickel Plate."

Eastward.	Arrive.	Depart.
Buffalo Passenger	10 40 a m	10 45 a m
Chicago Passenger	9 20 p m	.....
Local Freight	4 30 p m	.....
Westward.	Arrive.	Depart.
Chicago Passenger	.....	6.30 a m
Fostoria Passenger	5 06 p m	5 11 p m
Local Freight	1 00 p m	.....

Rocky River Accommodation departs 7:40 a. m.; 1:40 p. m.

Euclid Accommodation departs 6:20 a. m.; 4.55 p. m.

All trains daily, except Sunday.

Cleveland & Pittsburgh.

	Arrive.	Depart.
New York Express	12 50 p m	8 00 a m
New York Express	6 35 p m	1 05 p m
Alliance & Akron Accom	9 40 a m	3 25 p m
Ravenna Accommodation	8 25 a m	5 00 p m
Night Express	*5 25 a m	*11 10 p m

*Daily; all other trains daily, except Sunday.

Mt. Vernon & Pan Handle Route.

C., A. & C. Ry. Co.	Arrive.	Depart.
Akron, Col. & Cin. "Flyer"	5 40 p m	8 10 a m
Akron, Col. & Cin. Night Express	7 00 a m	8 00 p m
Akron, Col. & Zanesv'e Ex	12 50 p m	1 05 p m
Akron & Orrville Accom	9 40 a m	3 25 p m

The 8 p. m. train runs daily. Elegant Pullman palace sleeping cars attached. All other trains daily, except Sunday.

Erie Railway.

Depot, South Water Street and Viaduct.

	Arrive.	Depart.
N. Y. & Pitts. Express	†5 38 a m	*8 25 a m
Fast N. Y. & Pitts. Express	*10 55 a m	*3 00 p m
Mahoning Accommo		†6 40 a m
Pittsburgh Express	†6 25 p m	
Youngstown Local	†8 05 a m	
Mahon'g div. & Pitts Local		*11 40 a m
Mahoning Val. Accom		†4 30 p m
Pittsburgh Express	†1 20 p m	11 10 p m
New York Express	*8 00 p m	.....

*Daily. †Daily, except Sunday. ‡Daily except Monday.

Cleveland & Canton Railroad.

(Standard Gauge.)

Depart for—

Zanesville and Coshocton—6.55 a. m., 3:05 p. m.
Canton—6:55 a. m., 3:05 p. m., 6:20 p. m.
Kent—6:55 a. m., *8:50 a m., 3:05 p. m., 6:20 p. m., *8:15 p. m.
Bedford—6:55 a. m., *8:50 a. m., 11:10 a. m., 1:30 p. m., 3:05 p. m., 5:45 p. m., 6:20 p. m., *8:15 p. m.
Newburgh—6:10 a. m., 6:55 a. m., *8:50 a. m., 11:10 a. m., 1.30 p. m., 3:05 p. m., 4:40 p. m., 5:45 p. m., 6:20 p. m., *8:15 p. m.
Canton and intermediate stations (Sundays only), 8:00 a. m., 4:20 p. m.

Arrive from—

Zanesville and Coshocton—10:25 a. m., 6:30 p. m.
Canton, 10:25 a. m., 2:35 p. m., 6:30 p. m.
Kent—*7:45 a. m., 10:25 a. m., 2:35 p. m., 6:30 p. m., *7:10 p. m.
Bedford—6:00 a. m., *7:45 a. m., 10:25 a. m., 1:05 p. m., 2 35 p m., 4:15 p. m., 6:30 p.m., *7:10 p.m.
Newburgh—6:00 a. m., 7:10 a. m., *7:45 a. m., 10:25 a. m., 1.05 a. m., 2:35 p. m., 4:15 p. m., 5:35 p m., 6:30 p. m., *7:10 p. m.
Canton and intermediate stations (Sundays only), 9:50 a. m., 6:10 p. m.
Trains marked * run daily.

Valley Railway.

FOR AKRON, CANTON AND MARIETTA.

Depot foot South Water Street.

	Depart.	Arrive.
Valley Junction Mail	*7 40 a m	*6 20 p m
Marietta Express	†11 15 a m	†2 20 p m
Valley Junction Express	*4 15 p m	*10 15 a m
Cleve. and Canton Express	*7 00 p m	†8 10 a m

*Daily. †Daily, except Sunday.

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Cleveland, Lorain and Wheeling.

All trains arrive and leave the Union Depot as follows:

	Depart.	Arrive.
Wheeling Express	6 45 a m	6 55 p m
Uhrichsville Express	4 00 p m	9 20 a m

OSCAR TOWNSEND Gen. Mang'r.

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Direct route, Columbus, O., to Circleville, Chillicothe, Waverly, Portsmouth, Ironton and Ashland, Ky. Three trains daily except Sunday. Favorite route, North and West, making close connection at Ashland, Ky., with the Chesapeake & Ohio Ry., through the canons of New River, passing White Sulphur Springs and the many Summer resorts of the Alleghenies in Virginia.

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	Depart.
No. 62, Accommodation	† 6 05 a m
No. 72, New York Express	* 8 10 a m
No. 72, Fast Pittsburgh Express	* 8 10 a m
No. 64, Fast Pittsburgh Express	* 3 00 p m
No. 66, Mantua Accommo	* 4 20 p m
No. 68, New York Vestibule Limited	* 8 25 p m
No. 70, Pittsburgh Local Express	*11 25 a m
No. 74, Jamest'n, Pitts. & Y'ngst'n Ex	† 4 20 p m
	Arrive.
No. 65, Fast New York Express	*10 05 a m
No. 61, N. Y. & Pittsburgh Express	* 7 15 a m
No. 71, Youngstown Local	* 2 10 p m
No. 67, Pittsburgh Express	†12 30 p m
No. 63, New York Express	* 6 50 p m
No. 63, Pittsburgh Express	* 6 50 p m
No. 69, Pittsburgh Local Express	† 8 55 p m
No. 73, Mantua Accommo	* 7 20 p m

*Daily. †Daily, except Sunday.

Baggage checked through to all points East.

Through tickets and information regarding the route can be obtained at office, 141 Superior street, and at Depot N. Y., P. & O. Railroad, South Water street and Viaduct, Cleveland.

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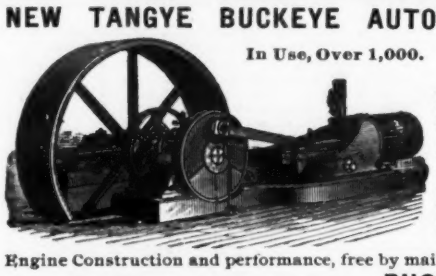

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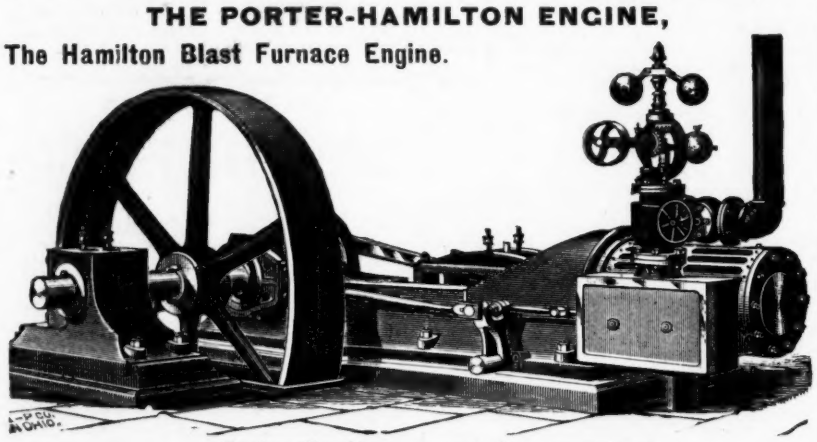

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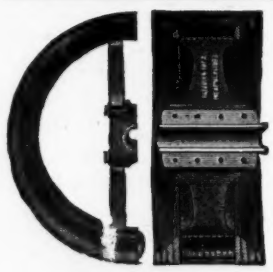

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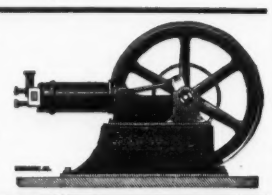

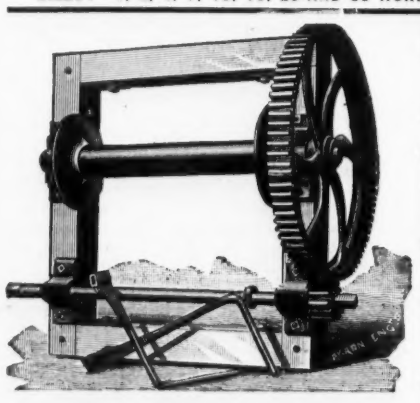

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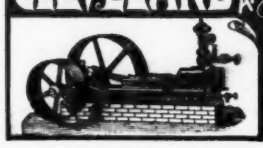

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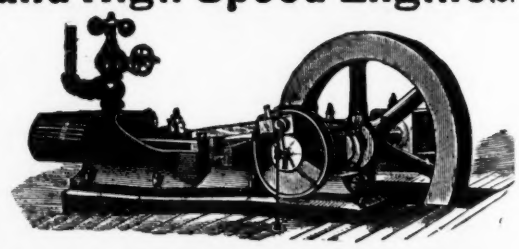

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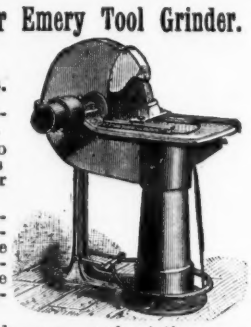

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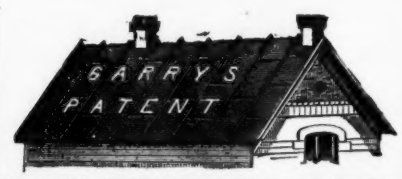

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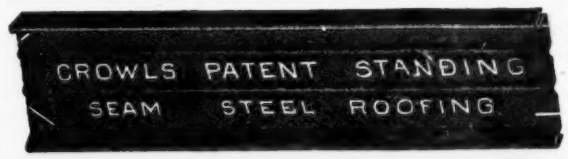

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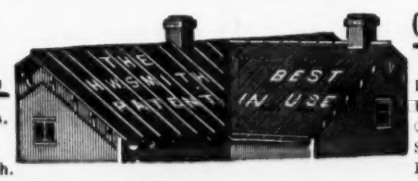

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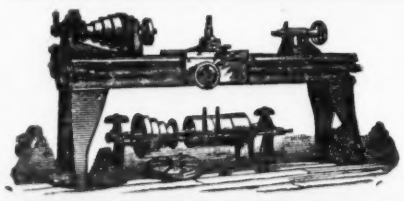

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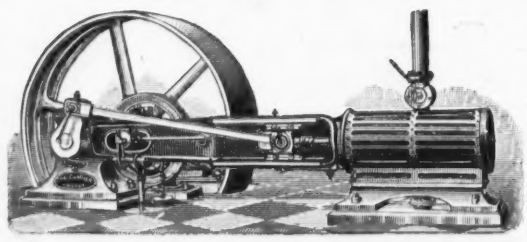

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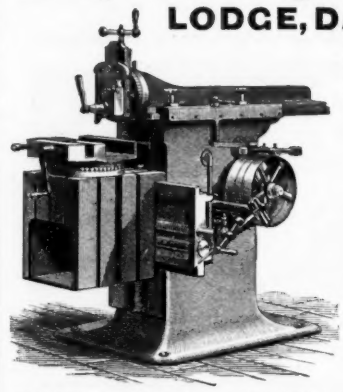

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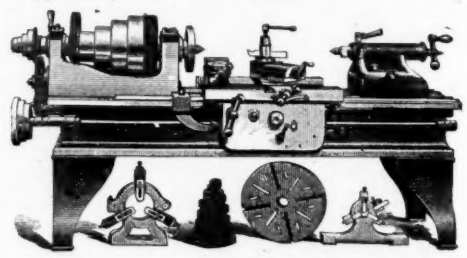

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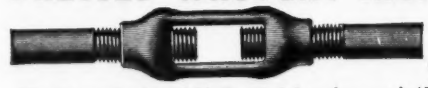

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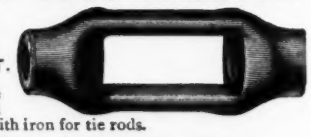

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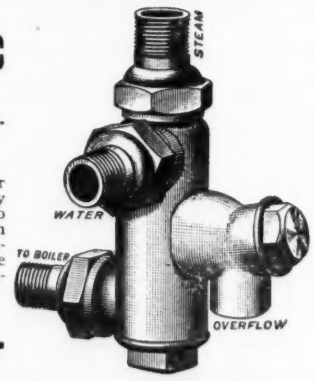

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